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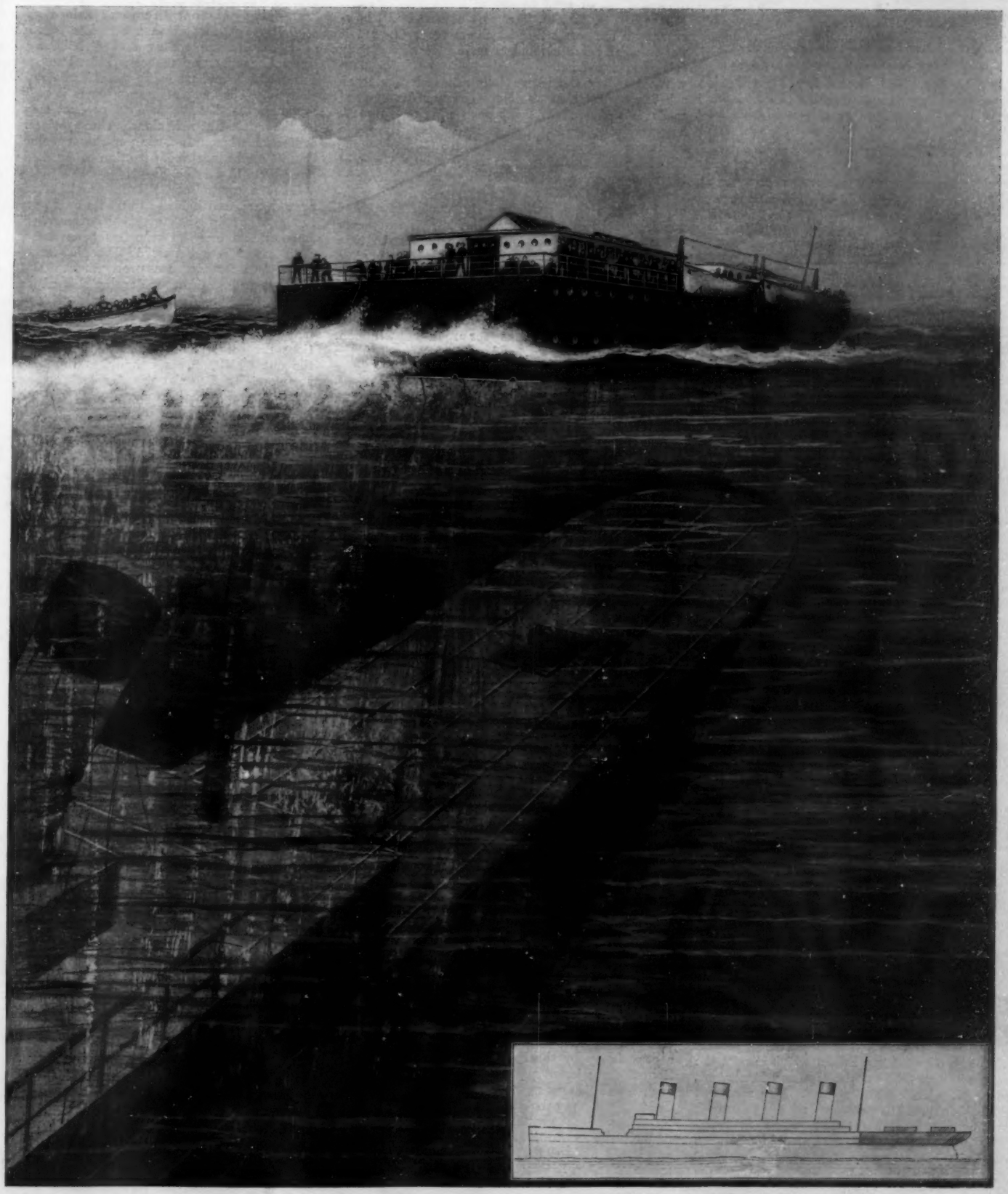

Shaded portion shows detachable pontoon section

It has frequently been suggested that a portion of a vessel's upper works might be so constructed, that it would remain afloat, in the event of the ship's going to the bottom.

A STUDY OF THE PONTOON METHOD OF SAVING LIFE AT SEA.—[See page 418.]

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The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

The purpose of this journal is to record accurately, simply, and interestingly, the world's progress in scientific knowledge and industrial achievement.

Why Expend $50,000,000 on Roads?

THE cry for good roads has extended from the Atlantic to the Pacific, and it has been a loud cry. How has it been answered? With true American spirit, it has been answered with generosity. Have the results, however, of the vast sums spent in improving the conditions of our roads been satisfactory and have they justified the vast outlay? The answer must be unqualifiedly, No! We as a people pride ourselves on our prudence, on our foresight, on our efficiency, on our capacity for accomplishing results. We consider that we belong in the front rank as engineers and as constructors, but have we, as road builders, lived up to our own standards? Why are the many roads leading to and from our great cities in such a deplorable condition most of the time? Is it because we do not know how to build or because we do not know how to conserve?

We apparently do not apply to our road problem the same economic laws that we believe to be essential to success in our great industrial works or in our great engineering problems, like the Panama or Erie canals. We would consider him a madman who, having built a magnificent building, would rest in complacency after its completion and say, "It is well done," and then allow the roof to fall to pieces. As far as our road construction is concerned, this is the method that we seem to follow. Our motto is, "Millions for construction, but not a cent for repair." How long are we going to follow such a course of folly? What are the reasons for it? How may these conditions be avoided, and what should our citizens do to put a stop to such errors? We have our annual conventions on road construction, and these meetings are of immense value, but until the people become aroused to the real evils of our system we shall go on wasting millions upon roads in our easy-going, happy-go-lucky way, but we cannot long go on our way rejoicing.

We may cite a few examples in the neighborhood of New York as showing how utterly our present system has failed. In Central Park the roads were in such a condition a year ago that a drive through the park was a doubtful pleasure. The authorities were sharply arraigned, with the result that many of the Park roads were entirely remade. The same course was followed upon the beautiful Riverside Drive. The road on Long Island which carries the greatest amount of traffic is the Hoffman Boulevard, connecting New York with Jamaica. This road was entirely rebuilt in 1910 with one of the new road compositions which have recently proved so popular. For a short time it was as smooth and even as a billiard table. The inevitable wear of a great amount of traffic, both from automobiles and the heavy trucks bringing vegetables and produce to market from the kitchen gardens of Long Island, soon began to make its impression upon this splendid road. The little depressions and spots of warning began to appear, and what measures were taken to arrest the natural decay of this road? None. The little depression was allowed to deepen into a rut and then into a hollow and then into a chasm, perhaps; but there were no repair gangs at work, and within a short time the work of disintegration had set in, and within twelve months the Boulevard was in little better condition than before it had been relaid.

In New Jersey the great artery of travel is the turnpike connecting New York via Jersey City with Newark. The history of this road is very similar to that of the Hoffman Boulevard. It was entirely rebuilt in 1910, and during 1911 it was a magnificent roadway. To-day it is a wreck, and one is fortunate if he can drive over it slowly without broken springs. A similar case may be cited in the roadway connecting Springfield with Plainfield, New Jersey. This road is much less used than the other roads mentioned above, but in the autumn of 1910 it was entirely rebuilt, and for a few months it was as magnificent a bit of road as any motorist could desire. It was left to its fate, like most of our roads, however, with the result that by the summer of 1911 it was in a sad condition and in some places hopelessly full of ruts and holes.

What policy should we follow in order to reach a better condition of affairs? The keynote of good roads is *upkeep*. Without such upkeep no road, however well made, will endure. On European roads the traveler will notice piles of broken stone all along the roadside, ever ready for the use of the road repairer. It is difficult to ride far on any road in France or Germany, or even in Italy, without finding a few, perhaps only one or two, road repairers at work. The traveler, here, hardly ever meets the repairer at work. He comes from time to time to a bar across the road with the warning, "Road closed. Under Construction."

Which method is the better and sounder of the two? Shall we continue to build roads under contract and then leave them to their fate, or shall we limit somewhat our plans for road construction, husband our resources, and retain a part of the money that could be used for construction in the work of conservation? Construction without conservation is futile. What measures should be taken to protect localities from the unwise use of its funds? In the first place, it is necessary that the public should be educated to the needs of the situation. The tax-payers must take an interest in the road question in each locality. They must see to it that they have men of probity and discretion as road masters. They must insist that an adequate measure of the amount of the budget in each locality be used for work of conservation. According to the laws of the locality in which they live, they should inform themselves as to what body is responsible for the condition of the roads, and such person or body should be held strictly accountable for their stewardship. Unless some such course is followed, we shall probably see little or no improvement in our highway condition, no matter how much money we may pour out in road construction.

There is at present a bill providing for the expenditure of $50,000,000 in the State of New York for road construction. So be it. The Empire State should be possessed of roads as good as any to be found in Europe; but mere road construction will not solve the problem we have to meet. Let the people make road *conservation* the keynote of its policy, and we then may go on fearlessly in our road construction; but until such a course is provided for—Beware.

The Compulsory License Question

WE have looked in vain to the printed testimony taken before the committee on patents of the House of Representatives, to which Mr. Oldfield's revision and codification of the Patent Statutes has been referred, for light on the very delicate matter of requiring patentees to grant licenses under compulsion if they fail to manufacture their patented inventions within a stipulated period. More than ever are we convinced that the plan proposed by the Inventors' Guild should be carried out, a plan which called for the appointment of a commission by the President, to study the operation of our present patent system, and to advocate such legislation as may be necessary to correct its defects. It may be that such a commission will recommend the granting of compulsory licenses under certain conditions; but the conditions must be so clearly defined that injustice shall not be done to the patentee, to the manufacturer, or to the public.

The compulsory license provision was incorporated in the proposed measure to prevent the suppression of inventions by huge manufacturing firms. As much was openly stated in the testimony. Yet no actual case was cited nor the name of any company mentioned. We prefer to believe that the great manufacturing corporations are hampered by their own size and thus prevented from introducing inventions of merit. Even prominent engineers in the employ of the so-called trusts find it difficult to induce their own corporations to introduce their inventions. If we are not mistaken Mr. James W. Gayley tried for ten years to interest steel makers in his dry airblast process. Despite the fact that he was superintendent of the Edgar Thomson Works, and later a vice-president of the United States Steel Corporation, despite the fact that he was a distinguished metallurgist, he found it difficult to introduce an invention which has effected a saving of hundreds of thousands of dollars.

There can be no question that a firm capitalized at many million dollars and employing thousands of men is an unwieldy piece of commercial machinery. Start it, and its inertia becomes so great that only with difficulty can it be stopped or swerved from its course. A revolutionary invention may mean the "scrapping" of an entire plant valued at millions of dollars; it may mean a complete reorganization of a complicated selling and distributing system. Special machinery has been devised to stamp out, grind, finish, and assemble metal parts rapidly and cheaply. The work of human hands is reduced to a minimum, so that the finished product may be sold by the carload at ridiculously cheap prices. Standardization of manufacturing machinery, standardization of methods, standardization of finished product have brought all this about.

That a compulsory license provision may work great harm, and indeed thwart its own purpose was brought out in the testimony of Mr. H. Ward Leonard, an inventor who has taken out one hundred patents and passed through the ordeal of thirty-four interference proceedings. He pointed out that an inventor may develop several methods of accomplishing one particular result. His researches and his experiments may entail the expenditure of many thousand dollars. He patents all the inventions for accomplishing that one result and selects the one which, in his opinion, is the simplest and commercially the most practicable. The other patented inventions he abandons. Suppose that a hundred million dollar corporation applies to him for a license to work under one of the abandoned patents, a corporation that has not spent one cent in research work, but which sees wonderful commercial possibilities in the invention. It has a splendidly equipped machine shop, a superb selling and distributing force, a highly efficient business organization. Shall the inventor be compelled to grant a license to a corporation which may wipe him out in a short time because it is a more efficient piece of commercial mechanism?

Mr. Leonard likewise attacked that section of the proposed law which obliges a patentee to manufacture his inventions after four years. Suppose, Mr. Leonard postulates, suppose that an inventor has made an improvement in electric locomotives, a machine that can be made by not more than two or three manufacturing corporations. Suppose that he offers it to each, and suppose that each refuses to construct the locomotive because there happens to be no immediate need for that type or because orders on hand will keep the works busy for some years. The inventor has exhausted every effort to sell his patent. Four years elapse. The locomotive is still unbuilt. As the compulsory license provision now stands, it would be possible for any of the firms that originally refused the patent to compel him to grant a license, perhaps under terms that may not be acceptable to him.

The "Great Eastern" and the "Titanic"

IN the matter of safeguards against foundering at sea, the "Titanic" was not so well provided as her famous prototype, the "Great Eastern," of over fifty years ago. Indeed, we do not hesitate to say that, in the extent of her double-hull construction, in the most important question of height of top of bulkheads above the waterline, and in the provision of longitudinal subdivision, the great ship of the year 1858 was immeasurably superior to the boasted product of our ever boastful twentieth century.

If anyone doubt the truth of this statement, let him look at the cross-section of the two vessels, published on another page, and judge for himself.

If, with such an admirable precedent in the "Great Eastern," it be asked why the designer of passenger steamships has fallen so far below the excellent standards established by the great Brunel over fifty years ago, we can only answer that he has been trying to effect a compromise between the demands of unsinkability on the one hand and the ever-insistent demands of the owner and the passenger agent for increased cargo and passenger space and larger dividends, on the other.

Electricity

Chinese Students of Telephony.—At the Hawthorne plant of the Western Electric Company, at Chicago, there are three Chinese students, Chu Fu, Long Kuo Tsan, and Sung Pao Kien. They have been sent out by the Nan Yang University to study the mysteries of American telephony.

Export of Electrical Apparatus.—During the year 1911 the export of electrical apparatus reached the enormous figure of $19,355,536. This is considerably in excess of other figures in recent years. The increase is represented largely in instruments and appliances, whereas there is a decided loss in heavy machinery.

Electric Smelting of Tin in Great Britain.—Preliminary tests and more extended investigations in Cornwall with an electric blast furnace fitted with three carbon electrodes and supplied with current at 30 to 60 volts show a continuous yield of pure tin without the skilled labor required in the ordinary smelting method, without the formation of hard slag and with almost 100 per cent greater output.

New English Gas-electric Car.—A new 90-horse-power gas-electric passenger coach just placed in service on the Great Central Railway in England has fulfilled every expectation as regards performance, reliability and easy riding. A six-cylinder, four-cycle engine is flexibly coupled to a shunt wound generator which supplies current to the car motors, giving a speed of 45 miles per hour, and one man is sufficient to operate the car. A separate gasoline engine driven set drives a vacuum exhauster for the air brakes and a generator supplying current for lighting the car.

Hot Water Supplied by an Electric Power Plant.—The *Electrical World*, in a recent issue, described a progressive electric light plant which sold to its customers not only the current, but the exhaust steam that made the electricity; then on the demand of one of its customers, it collected the steam condensed and served the customer with hot water. As the company had no hot water main, a trap was set in the basement of the building to receive the condensate. This trap was arranged to tilt when it filled, and in so doing it closed the circuit of a two-horse-power motor which drove a pump that delivered the hot water for the customer's service.

Improved Tramcar Design.—While American street railways are trying out various "pay-as-you-enter," "pay-within" and "stepless" cars, our British and Continental cousins have been experimenting with double-deck cars which are so common in European cities. Two new types of electric car are to be tried in Liverpool, designed to facilitate prompt exit and entrance of passengers. In one of these cars the main feature is a central platform divided into three parts by brass rails, the two outer parts being used for exit and the inner part being the entrance for all passengers, a separate flight of stairs being used for ascent to and descent from the upper deck. In the other type, there are two sets of stairs leading to the upper deck from the platform at each end of the car.

Continuously Loaded Telephone Cable.—A new loaded submarine telephone cable, which does away with the bulges or thickened places where the loading coils are inserted in the ordinary cables of this type, has recently been laid across the English Channel between Abbotscliff and Cape Gris Nez. The new cable is of the continuously loaded type, the inductance which constitutes the loading being obtained not by coils inserted at intervals, but by a continuous, close helical winding of 0.012 inch steel wire over the copper conductor, the latter being made up of a central wire surrounded by copper tapes. Each conductor thus overwound with steel is covered in the usual way with gutta-percha, and the cable consisting of four of these conductors (making two talking circuits) is laid and armored as is an ordinary cable. The freedom from bulged portions of course facilitates handling and laying, and the cable has met successfully all the attenuation-factor requirements.

Electric Elevators for the Naples Subway.—The most recent details about the new metropolitan line for Naples state that it will have a considerable length of subway running under the city, and when under the heights of Vomero the tunnel will lie about 500 feet below the surface. Electric elevators will be used here as well as at all places lying at depths of over 45 feet. The subway is built for double track standard gage, and will have a masonry lining in the dry parts or brick and concrete where the soil is wet. Recesses used as shelters are spaced along at 80-foot intervals and will contain electric lamps. The stations resemble those of the Paris subway and accommodate trains of four cars of 46-foot length. At one end the line connects with the Vesuvius railroad outside the city limits, and at the other it joins a suburban electric road of some length, changing thus from subway to surface running. The estimated cost of the undertaking is about $6,000,000.

Science

Bottled Gas for Home Use.—Dr. Walter O. Snelling, consulting chemist of the Bureau of Mines and of the Panama Canal Commission, now doing laboratory work in Washington, has developed a liquid gas of which a little steel bottle will carry enough to light a house for a month. Snelling puts 2,000 feet of gas into a steel container four feet high and six inches in diameter.

New Aerological Station in Germany.—Germany, which already possesses a far greater number of institutions for the exploration of the upper air than any other country, is to have a new one, at Rostock. That city has given the necessary land, on which the station will be installed by Capt. Hildebrandt, of Berlin, and Prof. Kümmell, of Rostock. Besides the usual observations with meteorological kites and balloons, measurements of atmospheric electricity and radioactivity will be made.

Preserving the Tallest Trees in the World.—None too soon a popular movement has been set on foot in Australia to preserve the gigantic stringybarks (various species of Eucalyptus) of that country, which far exceed in height the famous "big trees" of California, and are the tallest trees in the world. These trees sometimes attain heights ranging from 400 to 500 feet. Their timber is exceedingly valuable, and for this reason they have been ruthlessly destroyed by lumbermen, while no proper steps have been taken to provide for their reproduction.

Sulphur as a Fertilizer.—Experiments by M. Boulanger have determined that sulphur (in the form of the familiar "flowers of sulphur") is a valuable fertilizer of soil, tending to materially increase the harvest. Its action is not direct, as in the case of other mineral fertilizers, however. It operates as a modifier of the bacterial flora contained in ordinary soil. It acts as a destroyer of noxious microbes on the one hand, while on the other it is favorable to the useful bacterial flora. This is proved by the circumstance that its influence is exerted only on normal earth. When the soil has been sterilized by heat the sulphur becomes inoperative.

A Book-making Exposition.—At Leipzig, the great center of the book industry in Germany, there will be held from May to October, 1914, an international exposition of book-making and the graphic arts connected therewith, including photography. It will serve to commemorate the one hundred and fiftieth anniversary of the Royal Academy for Graphic Arts and Book Industry at Leipzig. The exposition will include the following sections: The graphic and book arts; book industrial instruction; the manufacture of paper; photography and reproduction technics; processes of printing, publication and bookbinding; library work; educational appliances; machines, apparatus and implements; hygiene in manufactories and workshops; and the protection and welfare of workers.

Barometric Fluctuations in Subway Trains.—In an article published in the *Medical Record*, Dr. Edmund P. Fowler summarizes the results of a series of experiments made to determine the precise amount of fluctuation in air pressure in a train passing under the Hudson and East River tunnels. He finds that the greater the speed the greater and more sudden are the barometric fluctuations and naturally also the effect upon the ears. In the rear car more marked changes were noticed. On two occasions there was a fall of over four tenths inch mercury within the space of about one second. Such a change would seem to be so slight as to be negligible; but Dr. Fowler estimates that a pressure of one half inch mercury is equivalent to one fourth pound to the square inch.

The Fate of Andree.—Christian Laden, a Norwegian explorer, has returned to this country, with what he believes to be the first evidence of the fate of Andree's balloon. Laden was commissioned by the Royal Museum of Berlin, the University of Berlin, and the University of Christiania, to explore the unknown region of northwestern Canada and to obtain data about the Indian tribes in the region, some of which have never before been visited by white men. At a point two hundred miles north by west of the point at which it has been generally believed that Andree perished, Laden encountered a tribe of Eskimos, who related a story to the effect that several years ago a large bubble fell from the heavens, containing two creatures supposed to be "devils" and that these creatures were able to hurl forth fire and thunder from strange implements that they carried. The members of the tribe attacked the two creatures and succeeded in killing one of them with arrows, whereupon the other made motions to them signifying that he and his companion were shooting at birds for food and had come in peace. When the Eskimos realized that they had attacked human beings, who had no unfriendly motive, they fled in dismay, leaving the surviving white man alone. What became of him they do not know.

Aeronautics

A Record Flight from England to France With a Lady Passenger.—On April 29th Gustave Hamel repeated his flight across the Channel with Miss Trehawke Davies as passenger. In a strong wind and heavy rain he flew from Canterbury to Hardelot, near Boulogne, in 40 minutes, on his passenger-carrying Blériot. The crossing of the Channel was completed in 12½ minutes, or at a rate of speed of 90 miles an hour.

M. Blériot Visiting America.—M. Louis Blériot, to whose genius we are indebted for the modern monoplane, is at present doing us the honor of his first visit. Accompanied by ex-Premier Hanotaux, Leon Barthou, President of the Aero Club of France, and a number of other notables who are members of the Champlain Tercentenary Commission, M. Blériot arrived on the 26th ult. aboard the new French liner "La France." When asked about the transatlantic flight, he advanced the opinion that this would be accomplished as soon as a motor is perfected that will keep going for 48 hours. The Pekin-Paris aeroplane race, he said, was the chief topic of interest in France just now.

American Passenger-carrying Record.—There are several corrections to be noted with regard to Beatty's passenger-carrying record mentioned in our last issue. In the first place the weight given, as estimated, should have been 853 pounds. Secondly, none of the passengers lay prone. One sat on the front edge of the lower plane beside the passenger seat, while two others sat on a board placed back of this seat. Thirdly, the motor used was the regular Wright 4-cylinder motor of 30 horse-power, which makes the performance all the more remarkable even though the machine only rose some 20 feet in the air and flew the length of the aerodrome—about half a mile—in a straight line—a performance that was repeated.

An Aeroplane Fleet for Our Army.—Awakened to the fact that the Government is lagging far behind other nations in the matter of military aeroplanes, Secretary of War Stimson has asked Congress for a fleet of 120 aeroplanes to be built at the earliest possible moment. It is to be hoped Secretary Stimson's request will not meet with the same prompt refusal that was given to Representative Sharp's (of Ohio) amendment to the Post Office Appropriation bill recently, when a proposal of $50,000 for an experimental aeroplane mail service was denied, while shortly after Senator Crane introduced a bill providing for an appropriation of $1,000,000 for the connection of the executive departments with the White House and Post Office by means of pneumatic tubes, and another bill appropriating $250,000 for connecting the offices in the Senate and the House alone.

Vedrines Hurt in Brussels-Madrid Race.—On the 25th ult. Jules Vedrines left Paris for Brussels on his Deperdussin monoplane, but was obliged to alight at Douai, 117 miles distant, which he reached in an hour and forty minutes (70.2 miles an hour). Four days later he got his motor working satisfactorily again, and started to return to Paris. In the suburb of St. Denis, while volplaning from 600 feet, he struck some telegraph wires beside a railroad and was thrown out, sustaining a fractured skull. He was rushed to Paris on a train and his skull was trephined. Despite grave doubts of his recovery, this is now assured. Meanwhile, on April 30th, Aviator Bedel flew from Villacoublay, another suburb of Paris, to Bordeaux, making stops *en route* at Tours and Angouleme. Despite a heavy wind and snow squalls, he is reported to have averaged nearly 81 miles an hour.

An Offer for a Cup Defender.—Being desirous of securing a team of American aeroplanes to defend this country in the international race next September, the Aero Club of America has made a liberal offer to domestic builders to purchase for $10,000 each, any machines that succeed in covering a 5-kilometer circular course forty times (124.27 miles) in a continuous flight of not over 1 hour, 14 minutes, 33 2/5 seconds duration—a speed of 100 miles an hour. Proposals to build such a cup defender must be sent to the Gordon-Bennett Aviation Cup Defense Committee, 297 Madison Avenue, New York, before June 1st, and must be accompanied by a certified check for $1,000, which will be returned to the builder upon completion of the test. Each machine must be of American design and construction, with the exception of the motor and minor details and accessories. It shall be delivered at the designated place for trial by August 1st, and be accompanied by an American aviator, who shall pilot it in the test with the understanding that, if nominated, he will also fly it in the cup race itself. After alighting at the end of the test flight, the machine must be in condition to repeat its performance 24 hours thereafter without replacing any except unimportant minor parts. This most liberal offer will no doubt be accepted by a number of leading manufacturers who, it is to be hoped, will succeed in producing something fully as speedy as will be sent over from France.

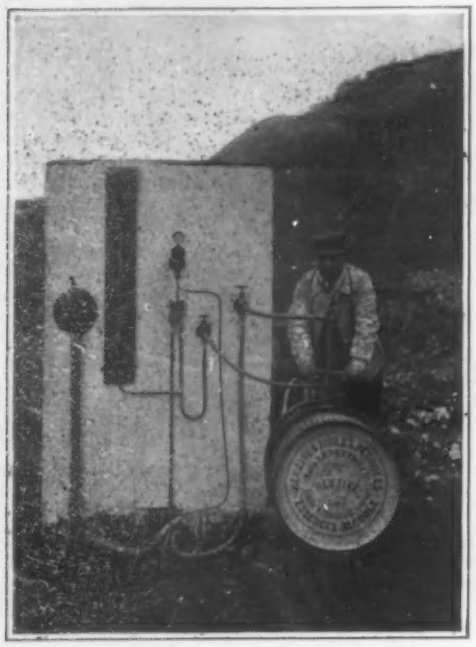


Fig. 3.—Apparatus constructed for a fire test.

Fig. 4.—The fire test.

Fig. 5.—The reservoir after the fire.

A Safe Way of Storing Inflammable Liquids

The Martini and Huneke Apparatus

By Jacques Boyer

SAFETY apparatus for the handling of inflammable liquids should be simple in construction and automatic in operation, as a safeguard against carelessness or malicious interference on the part of employees or other persons, and every part of the installation should always be in condition for immediate use. The most practical method of securing these essential conditions consists in making the atmosphere above the liquid non-explosive by substituting an inert gas for air. This principle is adopted in the Martini and Huneke system, which is here described and illustrated, and which is employed extensively in various countries.

The inert gas, carbon dioxide or, preferably, nitrogen, is employed under pressure and determines the flow of the inflammable liquid in addition to protecting it from explosion. All of the pipes and valves are inclosed in this atmosphere of compressed inert gas in such a manner that the slightest rupture of any part stops the flow of the liquid, which falls back into the reservoir, where it is protected from direct ignition as well as from explosion by the same inert atmosphere. In short, the system eliminates all danger of explosion due to an external cause or to electric sparks produced by the friction between the liquid and the pipes—a cause that has been suggested to explain some peculiar accidents.

The general scheme of the Martini and Huneke system is shown in Fig. 1. It comprises a perfectly staunch reservoir made of very thick sheet-iron, a receiving post, one or more delivering and measuring posts, a cylinder of compressed nitrogen or carbon dioxide, and a series of connected pipes. The reservoir is coated with asphalt and is buried in the ground so deeply that it cannot be injured by a conflagration. The iron is in contact with inert substances only, so that it does not rust.

The compressed nitrogen or carbon dioxide flows from an ordinary commercial cylinder *B* (Fig. 1) through the pipes 1 and 2 and the reducing valve *D* to the underground reservoir. The cask of gasoline or other liquid *T* is connected by rubber tubes to the valves *E* and *G* of the receiving post. The liquid is siphoned into the reservoir through the valve *E* and the pipe 4, while the inert gas flows from the reservoir to the cask through the pipe 3 and the valve *G*. In small installations the flow of liquid is started by means of a hand pump, while in larger ones a momentary excess of pressure is produced in the cask by closing the cock *R* which connects the pipes 2 and 3.

Liquid is drawn from the reservoir by depressing the lever *S* of the delivery post. The pressure of the gas in the reservoir then forces the liquid upward through the pipe 5. The delivery valve, shown in Fig. 2, is closed by a spring the instant the lever is released. This arrangement assures the presence of the attendant during the operation of drawing off the liquid.

The pressure of the gas in the reservoir and pipes is indicated by a mercury manometer *L* (Fig. 1) and the height of the liquid in the reservoir at any instant can be read on an aluminium scale attached to a chain which passes from a float, over a pulley, to a counterpoise *N* (Fig. 1).

Every pipe which contains liquid is surrounded by a larger pipe which communicates with the gas of the reservoir. If a fissure occurs in any of the outer pipes sufficient gas escapes to reduce the pressure to that of the external atmosphere and the liquid in the pipes falls back into the reservoir. A fissure in an inner pipe produces the same result by equalizing the pressure acting on both ends of the liquid column, and this result can also be produced by opening a valve, when it is desired to empty the pipes in order to prevent congelation or for any other reason. It should be noted that the production of an explosive atmosphere in a cask which has been emptied into the reservoir, by the admixture of air with the vapor of the small quantity of liquid which is left in the cask, is avoided by this method.

For further security each of the pipes which enters the reservoir terminates in the anti-diffusion device shown in Fig. 1, which prevents the entrance of air into the reservoir if the pipes are destroyed by a conflagration or other accident. In this case gas escapes by bubbling through the short column of liquid in the apparatus until the excess of pressure is balanced by that column. Finally, all of the pipes filled with gas which surround the liquid pipes are provided with plugs which melt at a low temperature and thus, in case of fire, assure the automatic emptying of the liquid pipes by removing the gas pressure, in the manner explained above. One of these fusible plugs is shown in Fig. 2, immediately under the valve.

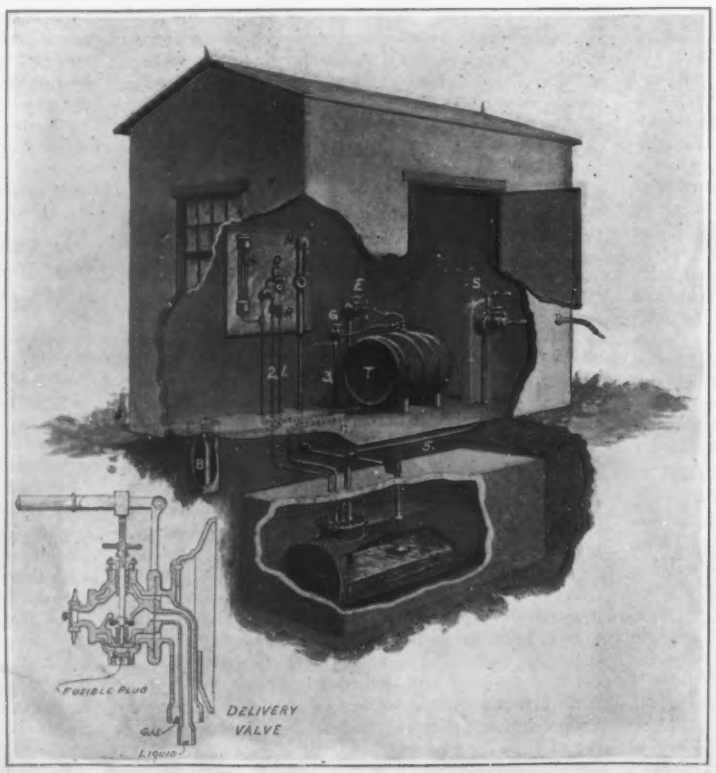


Fig. 1.—Martini-Huneke apparatus for storing inflammable liquids. Fig. 2. Diagram insert of section of delivery valve, showing inner tubes for liquid and outer tubes for nitrogen.

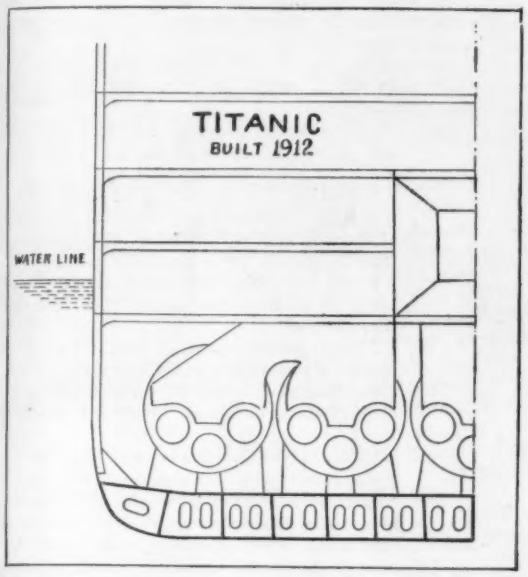
The company which controls the Martini-Huneke system in France gave a remarkable demonstration of the efficiency of the system last November at Montreuil, on which occasion the accompanying photographs were made. The experimental installation, shown in Fig. 3, corresponds with the scheme outlined above with the exception that all of the apparatus was attached to a brick wall and the pipes were not buried but were left unprotected in order to make the test more severe. The reservoir, of 275 gallons capacity and containing 220 gallons of benzine, was placed in a pit and covered with sand to a depth of 20 inches (Fig. 5). Wood, saturated with benzine, was piled around the apparatus and pipes, and over the reservoir and the cylinder of compressed gas. This wood was then ignited, producing the lively conflagration shown in Fig. 4.

Almost immediately the fusible plug of the delivery valve melted, relieving the pressure of the gas, and the benzine in the pipes flowed back into the reservoir. The fire, which was allowed to burn out, left the pipes in a sadly damaged condition, but the reservoir remained uninjured as is shown by the photograph (Fig. 5) which was taken after the fire.

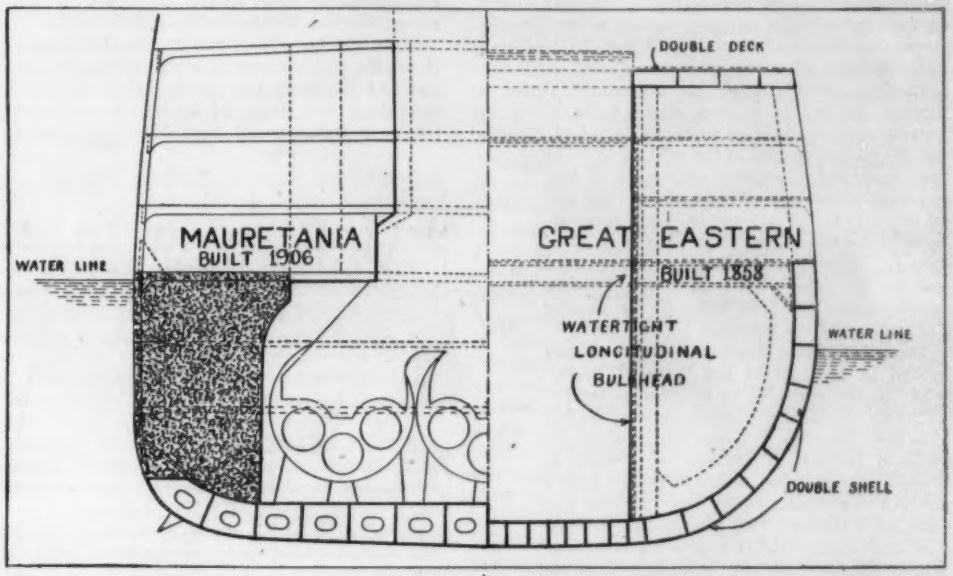
The "Unsinkable" Ship

Longitudinal Coal Bunkers and Higher Bulkheads Might Have Saved the "Titanic"

By J. Bernard Walker



"Titanic," 1912.—Double bottom; no longitudinal bulkheads. Boilers clear across ship, bunkers arranged athwartship.



"Mauretania," 1907.—Double bottom; longitudinal bulkheads in wake of engine and boiler rooms. Wing bunkers.

The "Great Eastern," 1858.—Double shell; longitudinal and transverse bulkheads, all carried to topmost deck.

CROSS-SECTIONAL VIEWS OF THREE FAMOUS SHIPS

IN the year 1890 the British Board of Trade, to whose altogether inadequate stipulations as to lifeboat accommodation on passenger ships the loss of life on the "Titanic" must be largely attributed, undertook to lay down adequate rules to govern bulkhead construction on steamships. The stipulations, as explained by Prof. J. H. Biles, of Glasgow University, in his book "Design and Construction of Ships," are as follows:

"A vessel is considered to be safe, even in the event of serious damage, if she is able to keep afloat with two adjoining compartments in free communication with the sea. The vessel must therefore have efficient transverse watertight bulkheads so spaced that when any two adjoining compartments are open to the sea, the uppermost watertight deck to which all the bulkheads extend is not brought nearer to the surface of the water than a certain prescribed margin.

"The watertight deck referred to is called the 'bulkhead' deck. The line past which the vessel may not sink is called the margin of safety line.

"The margin of safety line, as defined in the above report, is a line drawn round the side at a distance amidships of three one-hundredths of the depth at side at that place below the bulkhead deck, and gradually approaching it toward the aft end, where it may be three two-hundredths of the same depth below it."

The "Titanic," lying in 2,000 fathoms of water in mid Atlantic, suggests that this bulkhead stipulation is inadequate—even as her 1,600 dead are proof that the Board of Trade's call for lifeboat accommodation for one person in three was a clear invitation to the wholesale loss of human life which took place.

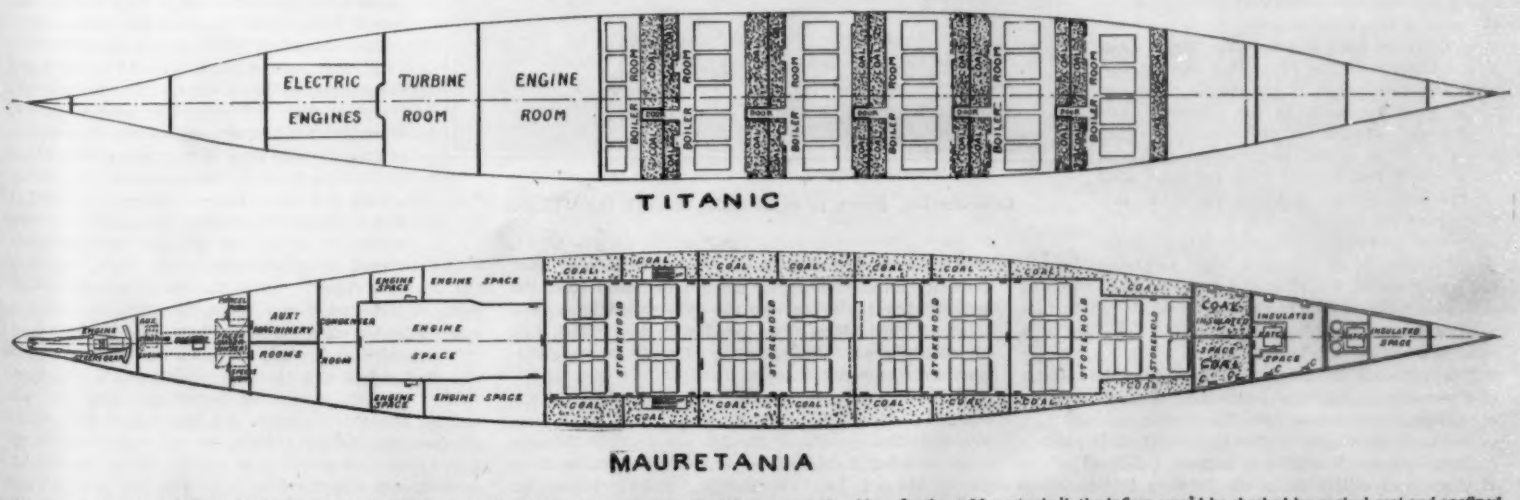
Over fifty years ago the great engineer, I. K. Brunel, working with that free hand which was accorded engineers of those days, produced in the "Great Eastern" a ship which was unsinkable by the ordinary accidents of the sea—a ship so sanely designed that, we do honestly believe, she might have survived even the extraordinary blow which sank the "Titanic." On one occasion, indeed, during a voyage to New York, the "Great Eastern" struck a submerged rock, tore a hole 80 feet long in the outer skin of her double shell, and was brought safely into port.

So nearly unsinkable was the "Great Eastern," so excellent a model (with certain modifications necessary for present requirements) is she for the naval architect of to-day to follow, that we present a half cross-section of the ship showing her structural features. Her principal dimensions were, length over all, 692 feet; width, 83 feet; and molded depth, 58 feet. At load draft she drew about 26 feet of water. Her hull was built of iron, Bessemer steel not being available at that date. The hull from stem to stern was built with a double shell, which extended to a height of about 10 feet above the load water line. The two hulls were 3 feet apart, and they were joined by no less than 35 plate-iron webs running longitudinally throughout the ship. The spaces thus formed between the two skins were subdivided by transverse webs into a vast number of small, separate, watertight compartments. The top deck of the ship was also of iron of similar cellular construction.

Further to protect the ship against foundering Brunel divided the inner hull into eleven watertight compartments by means of ten transverse bulkheads, which were carried up, not, as in average present-day practice, to from 10 to 15 feet above the water line, but right up to the top deck of all, or say to a height of 30 feet above the water line. Not content with this, Brunel ran two longitudinal bulkheads, extending from the bottom to the top deck of the ship, throughout the whole length of the engine and boiler spaces; so that if both the outer and inner skin were punctured, the water would be stopped by a watertight bulkhead 18 to 20 feet from the side of the ship. Furthermore, to preserve the vessel on an even keel, there was provision for flooding the opposite compartment, if it were so desired.

Why the early shipbuilders, with such a splendid object-lesson in safe construction before their very eyes, abandoned the principles laid down by Brunel, and built their ships, for many a decade, with a single shell, with no double bottom, and with but few transverse bulkheads, cannot be definitely stated but may be very safely surmised. There was keen competition in the early days of the iron and steel steamship, and it is fairly certain that the desire to save in weight and first cost and the ever insistent demand for increased accommodation for freight and passengers, led to the abandonment of Brunel's safe, but costly and somewhat inconvenient methods of construction.

Then came the inevitable penalty. Heavy seas, sunken reefs, collisions with ships or icebergs, proved how frail was the egg-shell construction of these iron ships. And hence the ship owners permitted the naval



A rupture of the shell plating of the "Titanic" admitted water to large compartments extending clear across the ship. In the "Mauretania," the inflow would be checked by packed coal and confined to small bunker compartments. The "Mauretania" was built to navy requirements, and this construction was required to prevent sinking by torpedo, should she be taken over as an auxiliary cruiser. It is questionable if the berg which struck the "Titanic" would have sunk the "Mauretania."

RELATIVE PROTECTION AGAINST FLOODING IN "MAURETANIA" AND "TITANIC"

architect gradually to incorporate some of the features of the "Great Eastern." Bulkheads began to be spaced more closely and the double bottom was reintroduced.

The most notable advance in this return to safe practice occurred when, in 1889, Mr. Biles designed those two most admirable ships, "The City of New York" and "The City of Paris." Although their registered length was only 517 feet, they were divided by 14 athwart-ship bulkheads into 15 separate watertight compartments, whose average length was only 37 feet, as compared with the 16 compartments in the "Titanic," the average length of which was 53 feet. In addition to this restriction of inflow of water, due to small compartments, Biles carried his watertight decks up through the height of two whole decks above the water-line, or say to a height above the water, throughout the central portion of the ship, of 18 to 20 feet as against a height of only 10 to 12 feet amidship in the case of some of the later and larger vessels. Furthermore, each compartment of the "New York" was entirely self-contained. There were no openings leading from one to the other. Communication between compartments could be had only by passing over the top of the bulkhead.

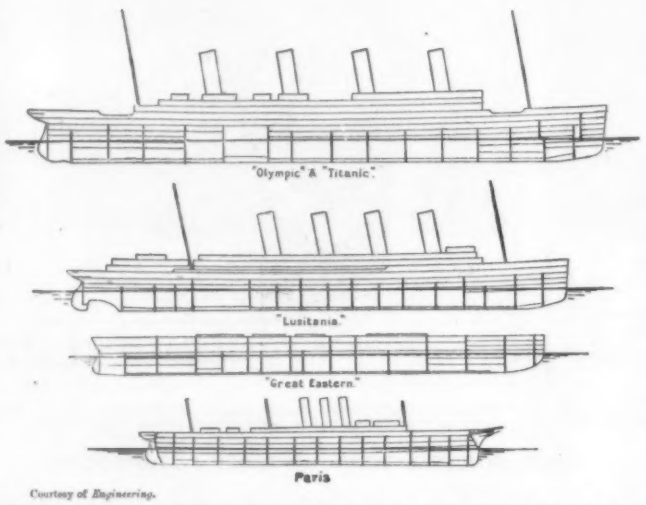
The value of this excellent construction was proved in the case of the "City of Paris," when, as the result of an accident to her engine, two adjoining compartments were flooded at a time when the ship was 150 miles off the coast of Ireland. There was no wireless in those days, and it was nearly three days before the ship was finally towed into port and her passengers landed. Had this vessel contained the large compartments and lower bulkheads which characterize later construction, in all probability she would have gone to the bottom. In this connection we direct attention to the accompanying table and diagrams, reproduced by the courtesy of *The Engineer*, which show the character of the bulkhead subdivision on the "Titanic," the "Lusitania," the "Great Eastern," the "Paris" and other notable ships. In the matter of height of bulkheads above load water-line, the "Great Eastern" stands first, followed by the "Paris," the "Lusitania" and the "Titanic."

	Date of build.	Registered length.	No. of main W.T. bulkheads.	Average length of compartment.	Per cent of length.
		ft.			
"Titanic"	1911	852.5	15	53	6.2
"Lusitania"	1907	762.0	16	45	5.9
"George Washington"	1908	699.0	13	50	7.1
"Great Eastern"	1854–9	680.0	9	68	10.0
"Carmania"	1905	650.0	12	50	7.8
"Campania"	1893	601.0	8	67	11.1
"New York"	1888	517.0	14	37	6.7
"Alma"	1894	270.7	11	23	8.3

The modern warship represents the nearest approach to an unsinkable ship. Protection against gun attack above the water-line is assured by heavy armor; below the water-line the ship is protected against torpedo attack by constructing the hull with an inner and outer shell, as in the case of the "Great Eastern," and by subdividing the ship by means of bulkheads carried everywhere up to a heavy watertight, protective deck, located at the water-line level—the compartmental subdivision in the case of the warship being much more minute, however, than it was in the "Great Eastern." Outside of the protection against torpedo attack afforded by the double shell, our latest warships, such as the "Nevada" and "Oklahoma," are further protected by the construction of a strong longitudinal bulkhead about 8 or 9 feet inboard from the inner shell of the ship, which extends on each side throughout the greater part of her length. The space thus provided has no machinery or stores placed within it, its sole duty being to prevent inrushing water, due to the blow of a torpedo, from reaching the large inside compartments of the ship. To further localize the inflow, this passageway is subdivided by a number of transverse bulkheads.

Now, although the minute subdivision of the interior of a warship cannot be adopted on an ocean liner without seriously interfering with the placing and operation of the large boiler and engine equipment, it is possible to introduce the longitudinal torpedo bulkhead of the warship, and utilize the space between this bulkhead and the side of the ship for coal bunkers. This protective arrangement was one of the structural elements which the British Admiralty insisted upon in the case of the "Lusitania" and "Mauretania," when, in consideration of their receiving a heavy government subsidy, the company agreed to build them with certain safety provisions which would render them available as auxiliary cruisers, should they be required by the British government in time of war.

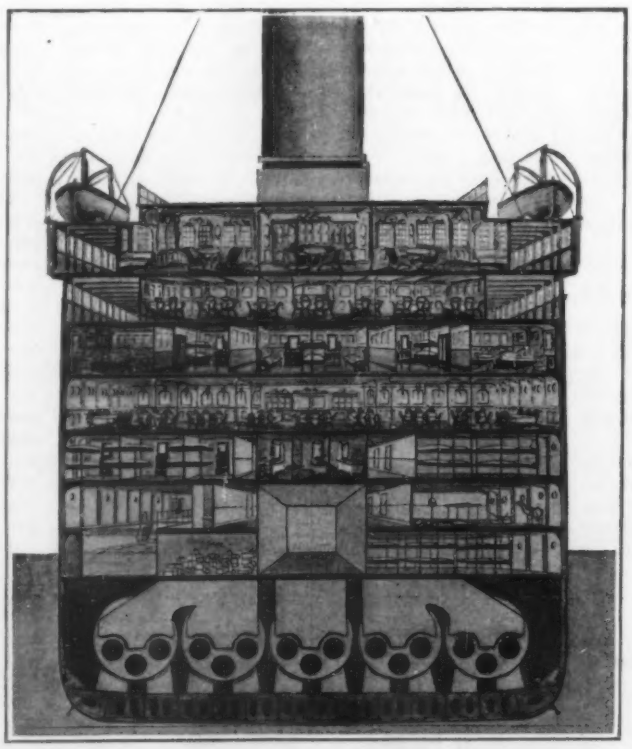
We direct attention to the cross-section and plan of these ships. It will be noted that there is a continuous line of bulkheads on each side of the engine and boiler rooms, extending from the after transverse bulkhead of the engine room to the forward transverse bulkhead of the boiler rooms. In the wake of the boiler rooms, the space thus formed is utilized for coal bunkers. Now, it will be evident that if the "Mauretania" had struck the long, glancing blow which sank the "Titanic," and had fractured the plating or started the seams throughout the length of several compartments, the inflow of water would have been restrained by the coal bunkers; and since they would have been at least partially filled with rather finely subdivided coal, the weight of water taken into the ship would have been relatively insignificant compared with that which had access to the whole width of the "Titanic" in such compartments as were leaking.



Courtesy of *Engineering*.

The bulkheads of "Great Eastern," 1858, were carried up to topmost deck, 20 feet above the sea. Note high bulkheads of "Paris;" which, in 1890, with the two largest compartments flooded, remained afloat for three days at sea and was safely towed to port.

A comparison of bulkhead protection 1858--1912.



Cross-section, drawn to exact scale, through the "Titanic."

Referring to the cross-section and plan of the "Titanic," it will be seen that the coal bunkers were arranged transversely of the ship and against the main transverse bulkheads. This permitted the boilers to be placed abreast, in lines extending entirely across the ship. For convenience in firing this was an admirable arrangement, bringing the coal supply immediately in front of the fire doors. From the viewpoint of safety, however, it proved to be fatal; for it is evident that any rupture of the outside skin of the ship admitted water to the whole of the compartment affected.

It will be evident, even to the layman, that, as between the longitudinal bunkers of the "Mauretania" and the transverse bunkers of the "Titanic," the system adopted on the former ship is immeasurably superior. And it is our sincere hope, as it will be that of every independent technical journal, that in the forthcoming international congress, to determine what measures shall be taken to render future passenger steamships more nearly unsinkable, the practice of placing the bunkers along the sides of the ship will receive unanimous recommendation.

Summing up then, we take it that the principal improvements which should be introduced into future merchant ships are:

First, the extension of the double bottom construction up into the sides of the ship to a point somewhat above the deep load line.

Second, the construction of longitudinal watertight bulkheads parallel with the sides of the ship, and at a sufficient distance therefrom to provide for bunker requirements.

Third, the extension of all watertight bulkheads to at least one deck higher than the current practice.

Fourth, greater attention should be given to making all bulkheads sufficiently stiff to withstand distortion, under the extreme conditions of full flooding and heavy plunging of the ship in a seaway.

Fifth, the bulkhead deck, which forms the upward limit of all bulkheads, should contain only such openings as are absolutely indispensable, and greater care should be given to making it not only absolutely watertight, but strong enough to withstand heavy bursting pressures due to deep submersion of the ship.

Finally, the mechanism for closing watertight doors should have sufficient reserve of power to enable the doors to shear through any obstruction (coal or what not) which may be filling the opening. At the present writing the hydraulic system seems best calculated to secure this result.

The Pontoon Method of Life Saving at Sea

THE loss of the "Titanic" has brought into prominence once more a provision for life saving, in case of a ship's sinking at sea, which is by no means new and which is not so impracticable as, at first sight, it might be considered. We refer to the proposal to make some portion of the superstructure of the ship a complete, self-contained, floating unit, which, in the event of the loss of the ship, would remain afloat and provide a safe refuge for the passengers and crew until they were taken off by some rescuing vessel.

That there is merit in the proposal, and that it can be practically applied, is shown by the fact that the Pollok prize for the best method of saving life at sea was awarded to a design in which the whole of the bridge structure was so built that it would float independently of the vessel.

It has been suggested that, in the case of a ship like the "Titanic," the large deck houses on the boat deck might be built upon this principle and so arranged that they could either be launched from special launching ways, or permitted to float free when they become sufficiently submerged to assert their buoyancy.

The objections to this arrangement are: First, that such structures would be too heavy to be launched in an emergency with any certanty of safe and successful operation; and secondly, that if the pontoons were left to float of themselves as the ship went down, they would be liable to become entangled with the smokestacks and their heavy steel guy ropes and either upset or seriously damaged. In nine cases out of ten, the damage to ships is received forward of midships and the vessel sinks by the head. Evidently, then, the best location for the pontoon structure would be at the stern of the ship, and preferably on the quarter deck.

We present, as a study of this question, the outlines of a design in which the upper decks of the after portion of the ship, astern of the midship structure, are utilized for this purpose. In the design shown, the pontoon extends for a depth of two decks, covers the full width of the ship, and reaches from the midship superstructure to the after-rail. For full security, and to provide the necessary stiffness, it might be built with a shallow, double bottom. The outside hull plating might be carried down until it lapped, with ample clearance, an inch or so over the plating of the ship

(Continued on page 427.)

Correspondence

[The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.]

"How Much, Then, Is a Man of More Value Than a Sheep?"

To the Editor of the SCIENTIFIC AMERICAN:

In the very interesting article in your issue of April 27th, entitled, "Wreck of the White Star Liner 'Titanic,'" occurs the following sentence, page 381, third column: "To which we reply, in the words of a certain venerable book, '*By how much, then, is the life of a man worth more than that of a sheep?*'"

Your "venerable book" is evidently the Bible; but in what version? King James's version has it, Matt. 12:12, "How much, then, is a man better than a sheep?" The English revision of 1887 and the American revision of 1901 are identical in their translation of this passage, and alike make it, "How much, then, is a man of more value than a sheep?" There may, or may not, be a great difference in the meaning of the passage as you quote it, and as it stands in either of the versions referred to; but as yours is a scientific journal, would it not be better, and particularly in editorials, to quote with absolute accuracy?

Baltimore, Md. (REV.) WILLIAM HERVEY WOODS.

"Nesting" Boats on Passenger Ships

To the Editor of the SCIENTIFIC AMERICAN:

As a result of the loss of the "Titanic" it seems probable that all Atlantic liners will be compelled to carry enough small boats to accommodate all the persons on board. The reason why the number of small boats has not kept pace with the increase in the number of passengers carried is due to two factors: the increasing confidence in the unsinkable character of the big boats and to the desire to keep the deck space clear for the use of the passengers. Thanks to wireless telegraphy, to be set adrift on the North Atlantic Ocean in a small boat to-day is not a very dangerous experience, provided the water is reasonably smooth.

To meet these new conditions I would suggest that the small boat be redesigned and built so that one will fit nicely inside of the other so that they can be "nested." In this way a 36-foot boat could take a 34-foot boat, and this in turn one 32 feet long, and so on up to 24 feet, by which time there would be seven boats occupying the deck space of but one boat. These would be in position to be launched by one davit, and although the pile would be higher than a single boat it need not be objectionably high. E. C. L. MILLER.

Richmond, Va.

The "Titanic" Disaster—Some Questions

To the Editor of the SCIENTIFIC AMERICAN:

Please permit the following important questions:

It was "proved" that the "Titanic" was "unsinkable."

But is it true that the sides of the "Titanic" were only of single thickness instead of being double like the sides of the "Lusitania" (or of any crack vessel worthy of the name)?

And is it not a sad, serious fact that where the transverse collision bulkhead of most of the modern liners joins the skin plating of the bottom and sides of the hull, the transverse plating is helplessly weak against the strain of colliding with rocks or with ice?

But most serious is the sad lack of lifeboat capacity, due to the old and ancient "rule" of average accident probability. Cannot crack liners be forced to quadruple their *present* lifeboat capacity? And if necessary to save space, cannot four lifeboats be nested one over another?

Owing to marine risks, and especially to the risk of the careening of a sinking liner, part of the boats carried will doubtless become useless, hence even a quadruple number of boats would probably not actually suffice to save all of the voyagers. And equally urgent are enough long booms (attached to short pole masts on the boat deck) to swing the boats into the water clear of the ship.

Do not for one moment permit the plea of lack of space and of over-weight.

And why cannot the law compel liners, during the dangerous ice season off the Banks (from early April to early July), to take a course more southerly still than the present southern course (even though involving over 200 knots extra steaming)?

Of course, that period is the eastward rush season; but is it not better, at present, to lose even twelve hours on each trip during these three danger months, than to sink among ice floes? Of course, much of this loss of time and of operating costs can be automatically regained by using Fort Pond Bay instead of New York as the American terminal, as this shortens the ocean trip.

The above questions merely refer to the most elementary, simple precautions and requirements, so as to avoid future "first aid," caused by *in extremis* damage that could not occur if prepared for.

Certainly too many such precautions appear to be oddly neglected, as, for example, the public urgent necessity for gas-engine propelled, self-righting lifeboats, which can be controlled during a gale. WHY?

New York city.

Search Lights on Atlantic Liners

To the Editor of the SCIENTIFIC AMERICAN:

As an old subscriber I crave a few minutes attention:

No Search Lights on Atlantic Liners.

Can you explain the reasons why the "Titanic" was not, and the present lines are not equipped with search lights?

Every modern man-of-war has many of them, and surely on a clear or even hazy night they could easily "pick up" an iceberg a mile or more away.

I recently returned from a voyage around the world, and one of the most interesting incidents of the trip was the passage of the Suez canal. We arrived at Suez at 2 P. M. and passed through the 90 miles of the canal that afternoon and night; arriving at Port Said at 4 A. M.—14 hours. The canal rule is that every ship must be equipped with a powerful search light before she is allowed to enter the canal, and as many of the tramp steamers do not have them, the canal company furnishes them. They are hung in a large box just under the bow. Our boat, a P. and O. liner, had her own light, and it was certainly a beautiful and unique sight to see the line of steamers one after the other with these wonderful lights illuminating the canal ahead of them as bright as day. I spent half the night with other friends up in the "eyes," and the man in charge would throw the light as we asked him, right or left, up or down. We could easily "pick up" a camel train or house a mile or more away on one side or the other, and show it up clearly and distinctly.

It would seem that if an Atlantic liner were forced by law to have a large search light on the cap of her stem, to be handled by the forward watch, or in rough weather, if the seas were coming over the stem (which they rarely do on the port or the starboard bows), by the men of the crow's nest, an accident such as that of the "Titanic" never would have happened, as the iceberg would have been seen.

San Francisco, Cal. M. HALL MCALLISTER.

Hearing Operas by Telephone

To the Editor of the SCIENTIFIC AMERICAN:

I have just read with much interest the article in your March 30th issue regarding the manner in which Detective Burns "caught on" to the plots of the labor union dynamiters.

While the simple arrangement of the telephones adopted by him was neither new nor novel, it reminded me of some rather more ambitious attempts in which I engaged in the late '80s to accomplish somewhat similar results. My aim, however, was to convey by wire from the stage of a theater to my residence, over a mile away, all the aerial vibrations awakened on the stage or in the auditorium, so that my family and friends seated in the quiet and seclusion of our parlor could enjoy a play, a concert or a lecture with as much satisfaction and less discomfort than was experienced by those of the actual audience who had to brave the inclemency of the weather in order to reach the place of amusement.

Through a judicious location of three or four sensitive solid-back transmitters over and around the stage of the theater, we did for two entire amusement seasons hear all of the operas, plays, concerts and lectures that were rendered in the Academy of Music, and with fully as much benefit and pleasure as fell to the lot of many of those who were within earshot of the stage. It was almost a nightly occurrence for ten or twelve persons, members of my family and invited friends and neighbors, to sit comfortably by the home fireside and listen simultaneously to the entertainment being given in the distant playhouse. Each listener being furnished with a headphone such as are usually worn by the telephone operators when on duty, the entire number of auditors could take in simultaneously all that transpired on the distant stage. In fact the words of the actors and actresses in many instances could be heard more distinctly and satisfactorily through the telephones than through the atmosphere of the auditorium. Often we would hear and understand points in the dialogue that escaped those who were in their immediate presence. We could at times even hear the voice of the prompter, and the occasional "asides" from the cast and employees that were not intended for the ears of the public. And during the intervals before and between the "curtains," while the audience was assembling and while they were awaiting another act, we could hear the rustling of silken skirts and the buzz of subdued conversation.

But the most interesting features of our experience in this connection was the attempt we made to wed the telephone and the phonograph into an intimately practical association; and we met with a small modicum of success in that direction too. We actually succeeded in recording on the phonograph cylinder direct from the diaphragm of the receiving telephone orchestral and vocal music transmitted over the wire from the Academy of Music, so that the selections could be reproduced by a repeating phonograph with great fidelity from the original wax cylinder of the recording instrument.

Edison's beautiful invention of the kinetoscope made its *début* in Richmond about that time, possibly a little earlier or later, and my first experience with one of the machines led me to make the confident prediction that not many more years would elapse before moving picture shows, now so universal, would make their appearance.

A couple of years ago (to be exact, in the issue of April, 1910) the *Southern Electrician* published an article from my typewriter giving full particulars regarding the experiments made at the time of which I am writing, and suggesting the possibility of eventually harnessing light vibrations as Bell had done sound vibrations. I reasoned that it ought to be possible in view of the action of light upon the electrical conductivity of chrystals of selenium, to devise apparatus that would transform light vibrations at one place into electrical vibrations to be transmitted through a suitable conductor to another and a distant point, and there be retransformed into light undulations. This is what the carbon button of the telephone transmitter and the telephone itself does for aerial vibrations, thus accomplishing my dream of ultimate television.

In the following June and July issues of the same journal I made a suggestion based upon what had already been accomplished in the field of the electrical transmission of sound, which I still believe is practical. I am surprised that the suggestion has not been adopted by the telephonic fraternity before this. It was this: The provision of an "entertainment and educational" department or bureau in connection with the existing telephone exchange systems in order to utilize the wire and plants at the times of lightest load at night and on Sundays, thus performing for the telephone practically the same economic service rendered the telegraph interests by the night and night letter telegrams. I see no valid reason why the telephone systems of our towns and cities should not be readily utilized for the spread of the gospel on Sunday, and the amusement and education of the general public in the evenings, by means of telephone transmitters judiciously located in churches and places of amusement so as to be readily connected through the exchange switchboards with the residences of a special class of entertainment patrons.

Very reasonable rates could be adopted for such special entertainment service, which would doubtless bring in a handsome special revenue during hours that the plant would otherwise be idle and unprofitable, and that without in the least interfering with the regular business of the exchange. Considering the immense harvest that is being reaped by the proprietors of the multitudinous moving picture shows and the very moderate additional investment that would be required to provide such a telephonic entertainment bureau, I am surprised that some of our enterprising telephonists do not try it on.

Norfolk, Va. C. E. MCCLUEN.

[Over thirty years ago the Editor of the SCIENTIFIC AMERICAN, Alfred Ely Beach, had a private telephone line from Plymouth Church, in Brooklyn, to his residence near Union Square, New York. Two Blake transmitters were attached to the rear of the preacher's desk and were energized by batteries. The transmitters were adjusted and tested every Saturday. Mr. Beach was able to hear perfectly both the Rev. Henry Ward Beecher's sermons and the music of the choir and organ while seated in his arm chair at home. On one Sunday, by special arrangement, communication was established through telephone exchanges with Elizabeth, N. J., and listeners in that city were able to hear Mr. Beecher preach. In 1878 or 1879 Dr. Alexander Graham Bell transmitted music from Chickering Hall, New York, to Yonkers—a feat that was considered very remarkable at that time.—EDITOR.]

Fast Track Laying

To the Editor of the SCIENTIFIC AMERICAN:

A number of articles have appeared recently relative to fast track laying. I am surprised that no one has drawn attention to the fact that the record for fast track laying, over eleven miles in one day, made by the Central Pacific in 1869, was never exceeded. The story connected with this record is extremely interesting and a matter of common knowledge in the West. This took place near Ogden, Utah.

San Francisco, Cal. FLORENCE A. HOFFMAN.

A relic of election time in Pompeii. Notices asking votes on the wineshop discovered in the Street of Abundance.

A Roman "bar" with its counter, wine jars, and covered copper boiler. The wineshop in the Street of Abundance.

By courtesy of the *Illustrated London News*.

Newly Discovered Paintings at Pompeii

A Revelation of Ancient Art

By Prof. Dr. Paul Hartwig

[*THE following article is from the pen of Prof. Dr. Paul Hartwig, one of the greatest authorities on antiquities in Italy. He was specially privileged to see these excavations. The State (the Italian government) which is in negotiation with Mr. Item for the purchase of his ground, is very jealous of any one seeing these paintings or the excavations. In fact the greatest secrecy is preserved. Prof. Hartwig was not permitted to make any notes while on the spot, and the pictures here reproduced were made by a photographer in Pompeii for Mr. Item before the government heard of the matter. It will be some time before better photographs can be made, because this may not be done until the government has completed the purchase. Negotiations with the government are very slow in Italy, since naturally it wants to pay as low a price as possible. The matter became so involved that the owner, as well as the government, went to law, and the suit is still pending. In the meantime, thanks to Prof. Hartwig, we are able to publish a description of this very noteworthy discovery.*—EDITOR.]

Some time ago, Mr. Aurelio Item, the owner of a well-known hotel in the city of Pompeii, commenced to make excavations on a piece of land northwest of the buried city which he had lately acquired. These excavations were made at his own risk and expense with the permission of the Italian government, and since the attempt proved successful, several other gentlemen who owned land near Mount Vesuvius took a financial interest in the undertaking.

Very soon it became evident that luckily they had struck upon a large villa which, according to all indications, must have belonged to distinguished persons in antiquity. It is situated about one mile from the Herculaneum gate of Pompeii on the road to Herculaneum. It is the same street in which the well-known villa of Diomede stands, but nearer to the gate of the town. The view from this point is one of the finest in the world: At one side Vesuvius; toward the south, the mountains of Castellamare, and toward the west the bay of Naples and Capri; so it is quite easy to understand that a great number of well-to-do families at the time of Augustus and his successors came here from Rome to spend the summer months.

The villa is only partly excavated now; in fact only about one-third has been brought to light. It appears that the villa is very large, but so far it has not been possible to establish the dimensions of the ground plan. Several small living-rooms, a very large kitchen with several adjoining closets and a part of the peristyle with Doric columns have already been excavated; also a part of the terrace which is ornamented with like columns, looking toward the sea, and a large hall 8 meters long (26¼ feet) and 8 meters wide, which was the dining-room or triclinium. This room we enter from the terrace through a wide door; it is high and has a vaulted ceiling of stucco which is partly preserved. The right wall of the hall is pierced in the middle by an opening about 4 or 5 meters (13 to 16 feet) wide, which was evidently intended to give ventilation to the dining-room. This window-like opening leads to a corridor and in all probability a portière served as a partition between it and the room. The walls on which the paintings are dispersed are as follows: two small spaces to the right and to the left of the entrance, the left wall unbroken by any aperture, the wall facing the entrance also in its entire length, and the two spaces to the right and to the left of the opening on the right wall, each of which is about tw› meters (6.6 feet) in width. A dado of about one meter (3.3 feet) in height is painted on the walls all round the hall, and on this the actual pictures are painted, which themselves are two meters in height, so that the knees of the figures appear on a level with the head of a standing man. At the top of the pictures rich incrustations of painted marble run around the room up to the ceiling. The dado and the frieze are in dark colors, black predominating. The lines which carry the figures are in great contrast in color to the pictures. They are of a deep terra-cotta red, almost fiery in its appearance, which is frequently found on the best walls in Pompeii and Rome. A vertical architectural partition of the entire painting is provided by fourteen unobtrusive and graceful pilasters of a greenish color. However, these do not influence the composition of the figures in any way, but only serve in the background as a division to aid the eye of the spectator.

Now, the question will be asked, is all this uninjured? Fortunately it is possible to answer almost completely in the affirmative. There is only one bad damage, and that at the center of the rear wall. For the rest the eye glances over these walls with their brilliant colors without meeting any offending feature.

We cross the hall where once the dining-table stood in horse-shoe form, surrounded by its upholstered couches on which the feasting inhabitants of the house once reclined. It is evident that the back wall is the kernel and the center of the decoration. From this part to the right and to the left, the further parts of the composition continue round the hall, finding their termination at the right and to the left side of the entrance-door. Only the corners of the room are void of figures, but the entire decoration forms in its contents one complete scheme. The representation on the back wall is divided into three groups, triptych-like. One of the center-pieces shows us a nude young god in the lap of an enthroned dressed figure of a woman; this is a composition often used in Pompeii for different deities, for instance, Adonis and Aphrodite. The figure of the man lying down is undoubtedly Dionysus; near him lies the thyrsus wand covered with vine leaves and the god is represented as

Reading from sacred scriptures (?)

Figure of a woman enthroned.

A group of Mænads.

THE GREAT COMPOSITION

Worship of Eleusinian Demeter.

Dionysus reclining in the lap of Demeter.

wearily reclining. He has discarded one of his sandals.

The figure of the woman on whom the god is leaning cannot be described since the whole upper portion is destroyed. Involuntarily one thinks of Demeter. The upper part of a group of two girls, of whom one holds a bowl, is also destroyed and the upper portion of the companion of Dionysus. To all appearances they are serving women attendant upon the enthroned figure. Undoubtedly they were only meant to be subsidiary figures. In front of these two girls a somewhat tall and matronly female figure kneels on the ground toward the right. She is lifting a cloth from an object, the form and name of which is known to us from the mystery rites of the ancients. It is the Liknon which is woven of willow leaves and which formed a part of the rite of the Eleusinian Demeter. Next to her stands another covered object, larger in size, which is very likely the symbol of burning vitality. This kneeling woman turns to the figures farther to the right, in the act of making an offering. The figures are five in number, all women. The person to whom this offering is intended in the first instance is a girl, who, in a kneeling position, hides her face in horror in the lap of a woman; her face is only seen in profile, dark locks fall over her temples. The other woman appears composed and, we must suppose, is comforting the young girl. Between her and the woman who is uncovering the sacred vessels, a winged figure of a woman holds a wand. This very remarkable production is painted as delicately as a Botticelli figure. The upper part of her body is nude and her hips are covered with a violet veil. The legs and knees are uncovered, but on her feet she wears golden shoes. From her back spread two large black wings which extend far back into the red background of the picture. To the right of this figure and the group of the standing and the kneeling woman, two more female figures are standing as if waiting for something, one is attired and turns toward us, and the other one is nude and is seen from the back. The delicate flesh tint is accentuated by a yellow veil which falls down on her right side. . . . We have now passed beyond the rear right corner of the hall, and have arrived at the edge of the wide window-like opening of the right wall. In the space between the front right corner and the window, the composition continues with four more figures. We see here a pale girl in a sitting position, looking toward the left. It appears to me that her face is a portrait. Ornaments are being placed on her; is she a bride or a woman who is being prepared for some sacred rites? A nude winged boy holds a mirror for her, in which her face is reflected; another boy with wings stands behind her alone in the narrow space next to the entrance-door.

We now return to the back wall. To the left of the centerpiece of the two deities, we see a group of four male figures, evidently companions of the wine god who is resting at their side. A sitting stout silenus holds in his hand a round half-transparent bowl, a youth standing behind him leans over waiting with avidity to drink out of it, probably some symbolic liquid. In his right hand, which is stretched out, he holds a very expressive mask over the shoulder of the old silenus. A boy stands at his side in the background, watching the scene. Both boys have pointed ears and are therefore a mixture of a human being and an animal, youthful satyrs. There is no doubt that both of these boys' faces are portraits.

There still remains the large wall at the left and the narrow space to the left of the entrance-door. We will begin with this latter. There is only one figure on it, a woman enthroned. Adjoining this figure on the long left wall is, first of all, a matronly figure moving to the right. She wears a light blue gown. Her right arm rests on her hip. Then comes a group of several figures which is one of the principal parts of the composition. A seated young woman is listening to a nude boy in golden shoes at her right, who reads to her something from a scroll. She herself holds a scroll in her left hand while she is playing with a pencil in her right. The hands are very beautiful, the fingers are slender and ornamented with beautiful rings; three females, apparently serving women, join her on the right. One carries a dish in her left hand and in the right, which is uplifted, she bears a laurel branch; this is very much like the marble figure found at Antium (Anzio). Another holds a bronze dish; all these articles denoting religious customs and ceremonies. What might be the contents of the scrolls in the hands of the sitting woman and the reading boy? Are they rules for the sacred usages, or explanations about the life in the next world, and the paths which lead to it, as were also contained in the Egyptian "Book of Death"? Next to the serving women with the vessels, a group of young women are crouching down; they are mænads, the female companions of Dionysus, who take part in his thiasos. They are charming and incomparable in their loveliness; a young deer has fled to the lap of one, where it has found some delicate buds which it is eating. And finally, toward the corner of the hall is the last figure, a woman going swiftly toward the right and forming the connection between this picture and the groups of the back wall. Her left hand is raised, the fingers of which are spread; her movement is almost a faithful but undoubtedly an unintentional copy of one of the daughters of Niobe in the well-known antique group which is under the roof of the Uffizi at Florence.

These portraits, several of women and some of men, are probably the most beautiful part of the discovery. The best of the Pompeian portraits which we have found so far, have a somewhat strange appearance, their widely opened eyes glaring at us as if they came from another world; whereas here, in these portraits, there is much to attract us intimately. They are people whom one would like to know, with whom one would like to shake hands. Their expression shows culture and good breeding; their hands are beautifully formed, there is exquisite movement in them; they remind us of Leonardi da Vinci's Last Supper, only that they are too richly ornamented with rings. Are the originals of these portraits the former inhabitants of this large and distinguished house? Have their features been taken as a model as the masters of the Renaissance took as models for their saints' pictures some contemporary person, sometimes even the man who ordered the picture?

The modern painter who reads these lines will naturally ask about the technique of the paintings here described. On a dried, solid, smooth surface, made up of the finest mortar and marble dust, wax colors have been mounted with a heated instrument and have been distributed and rubbed in in the same manner. This is not a new technique but was very common in Pompeii.

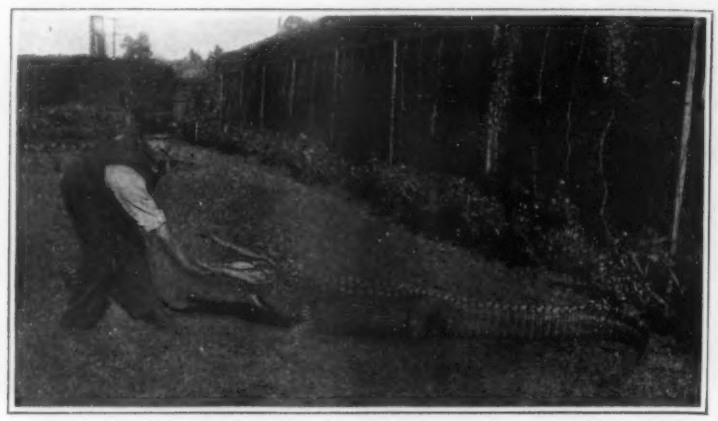
A young girl at her toilet.

Winged figure of a boy.

A very remarkable composition.

THE GREAT COMPOSITION

Alligator placed in this position will remain so for hours.



A fine specimen probably three hundred years old.

Alligator Farming

An Interesting Occupation With Little Competition

By Charles Alma Byers

IF you are looking for a business in which you may engage without fear of competition, why not try alligator farming? An odd industry, you may say, and so it is; but it is one, nevertheless, that offers enticing and interesting possibilities. In the Southern States there are already several alligator farms, it is true; but all dealers in the saurians and saurian products unhesitatingly admit that the field is far from being crowded. Then, too, the demand for alligators is rapidly increasing; and at the same time the supply of wild ones, once so plentiful along the Gulf of Mexico, is even more rapidly disappearing. And it may be remarked, parenthetically, that it is an undertaking open to women as well as to men, for, contrary to popular belief, there is very little danger involved in handling the reptiles.

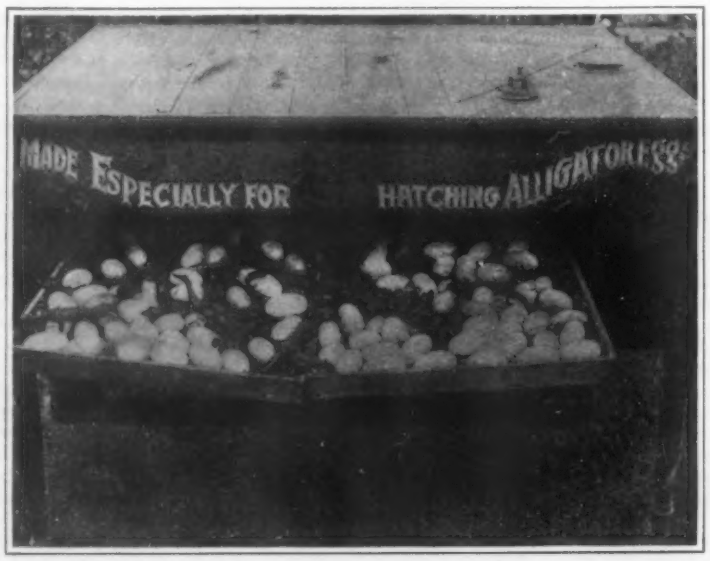
A most useful animal is the alligator. He is made into suit cases, purses, belts, watch fobs, gem boxes, chair cushions, table covers, cuff links, hat-pin settings, paper knives, and whistles! For not only is his hide used, but his teeth and bones as well.

Until about nineteen or twenty years ago, no alligator skins were used for any purpose whatsoever, and for several years thereafter only the smooth portion, which is found on the stomach, was made use of. The back, or horny portion, which is now regarded as the most valuable, if the reptile be not too large, was thrown away, it being considered too difficult to remove from the body and too stiff and hard to use satisfactorily. To-day the entire skin is used, and often a whole one is manufactured into a single hand bag. Skins of all sizes are in demand, although those from four to eight feet long are usable for a larger variety of purposes. For skins of these lengths, just as they come from the body, the tanneries pay, according to quality and length, from fifty cents to three dollars each. Only about ten per cent of the supply of raw skins are manufactured into finished articles in the United States, the remaining ninety per cent going to manufacturers in Europe. From the foreign manufactories the finished articles are shipped to nearly all parts of the world, but by far the bulk of their product is reshipped to this country.

Aside from the demand for skins for manufacturing purposes, there is always a market for live alligators, as well as for dead ones for taxidermists. Aquariums, museums, circuses, and dealers require them alive, and are willing to pay liberal prices for them in all sizes. Baby alligators, up to three years of age, at which time they will not exceed eighteen inches in length, find the most ready market, and are sold at from one to four dollars each. Larger ones are usually sold at practically so much per foot, a six-foot alligator bringing as much as twenty dollars, and the very big ones, from fifteen to eighteen feet long, which are desired mainly by aquariums, from seventy-five to one hundred dollars.

In the Florida Everglades several hundred persons, mostly Seminole Indians, depend solely upon the hunting and killing of alligators as a means of livelihood. Some of the dealers of the State handle on an average of seven thousand skins in a season; and while no official figures are obtainable on the subject, it is claimed that the State receives far in excess of a million dollars for the saurian product it ships out.

As the alligator supply in Florida is rapidly diminishing, during the last two years Mexico and Central America, the portions bordering on the Gulf, have been invaded. In fact, it is from these countries that the dealers to-day are receiving the larger portion of their supply. The demand is so great that the almost complete extermination of the wild alligator seems imminent, unless something drastic is soon done to curb the hunters. For several years laws with this aim in view, patterned somewhat after the various game laws of the country, have been spasmodically advocated, and in fact Louisiana has recently adopted one, but with this exception so far nothing has been effectively accomplished.



Large incubator built especially for hatching alligator eggs.

Some fine old alligators basking in the sunshine.

Realizing the possibilities and importance of the industry, a few enterprising men, in the last few years, have gone into the business of raising alligators. Alligator farms, of various sizes, are being maintained at a number of places in the Southern States, and a careful canvass of them shows that practically all of them have been paying institutions from almost the very beginning. One of the most widely known alligator farms in the South is located at Palm Beach, Fla., at which a collection of over one thousand saurians is kept. They range in sizes from tiny alligators, just hatched, to one, known as "Jumbo Joe," that measures eighteen feet four inches in length, and which is supposed to be about nine hundred years old. "Jumbo Joe" is a rare specimen, and aquariums all over the world have sought his possession with offers of comparatively fabulous sums. In the same collection there is also a crocodile, the largest in captivity, that measures seventeen feet seven inches long, and is estimated to be over two thousand years old.

The largest collection of alligators maintained on any one farm is at Los Angeles, Cal. It is owned by S. V. Earnest, and over two thousand alligators of all sizes comprise the collection. The largest specimen at this farm is fifteen feet long and weighs approximately nine hundred pounds. It was caught only a few months ago in the Everglades of Florida.

As it requires several hundred years for alligators to attain their full growth, it may seem that alligator farming could offer but little remunerative inducement. But as has already been stated, baby alligators are always in demand and bring very good prices, alive or dead. An alligator skin, however, cannot be considered truly valuable until the reptile has reached the age of at least six or seven years. But raising alligators for their skins alone cannot be seriously considered until the wild supply, shall have been even much more reduced than it is now. It is from the sale of baby alligators to aquariums, museums, and tourists, and from the admission fees charged curious visitors, that the alligator farms to-day derive their chief income.

(Concluded on page 487.)

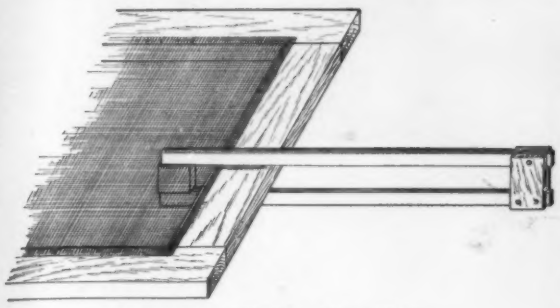
Suggestions for the Workshop

Ingenious Expedients of Resourceful Mechanics

Clamp for Screening Doors and Windows

By W. N. Lurcott

ALMOST every handy man has screened or re-screened frames with mosquito netting and no doubt has found it a difficult matter to draw the screen



Clamp for stretching wire netting.

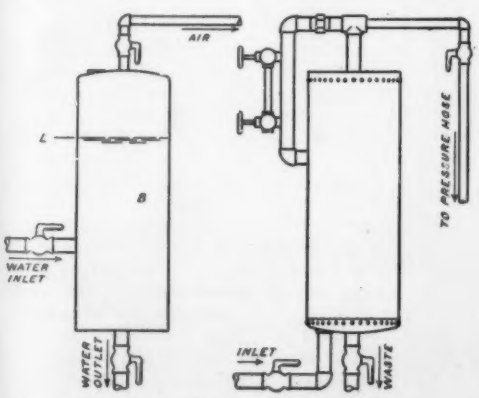
tight with the fingers, especially when the tacking was to be done very close to the edge. Here is a clamp which is easily made and quickly operated. The strips are made of rather hard wood about 1 inch wide, ½ inch thick and 15 inches long. Place the strips between two blocks about half an inch farther apart than the thickness of the frame, so the strain on the strips will fall edgewise, as shown in the cut. Two nails or screws are driven through the blocks and the lower arm and one through the upper arm to form a hinge. To the other end of the lower arm is fastened a soft wood block of such thickness that when the clamp grips the netting there will be about a half inch clearance between the lower arm of the clamp and the frame.

A Hydraulic Automobile Tire Pump

By Frederick E. Ward

IN taking care of an automobile, one of the most disagreeable tasks is the inflation of the tires by an ordinary hand pump, a labor almost great enough to discourage one from taking out the machine at all on a hot day if the tires happen to be "down." Almost all public garages are therefore provided with some form of power pump, such as a portable electric-motor-driven outfit, but the high cost of these has prevented their general introduction into the home garage.

Many private garages, however, are already provided with a water supply from city mains, and wherever the pressure from this source equals sixty pounds per square inch or more, the simple hydraulic pump shown herewith may be used with great satisfaction.



Two forms of hydraulic tire pumps.

As shown in the left-hand sketch, an ordinary forty-gallon kitchen tank or "boiler" *B* is mounted in an upright position and connected up with piping as shown. This tank forms a cylinder in which the air is compressed by the water, which acts as a liquid piston.

In operation, first the top and bottom valves are closed, and then the water inlet valve is opened. The water enters the tank and compresses the air, finally stopping at some level *L* where the air pressure just balances the pressure in the water mains. If the latter happens to be sixty pounds per square inch, the level *L* will rise just four-fifths of the way up, provided eight gallons of compressed air are available on opening the air valve. As the tire inflation proceeds, the water level rises, maintaining constant pressure. Of course, the process must be stopped before the air is all used, or water will follow the air through the hose and into the tires.

When judged to be nearly full of water, the tank must be emptied by closing the water inlet valve and opening the other two. If one desires, a gage glass such as is used on steam boilers, with connections as shown in the right-hand sketch, may be provided to show when the water needs to be emptied.

The entire outfit as described need cost but little money. A new tank costs about twelve dollars, but a second-hand one can usually be had from a plumber for the asking. For in towns where the water pressure is high, many kitchen boilers develop some minute defect and have to be discarded, even though they leak but a few quarts of water a day. A slight leak of this kind in an otherwise sound tank does no harm if placed at the bottom end, where it will spill water rather than air.

Three-quarter inch galvanized iron piping and fittings should be used for the water connections, but one-quarter or even one-eighth inch pipe will be found amply large for the air. In place of the more expensive valves, the ordinary "stops without waste" will serve the purpose satisfactorily.

A Handy Series Current Tap

By Paul H. Woodruff

ELECTRICAL experimenting on a small scale is becoming more tempting every day because of the convenient form in which the electric current is delivered to our homes for lighting purposes. The usual supply at 110 volts, however, is hardly suitable for most amateur apparatus; while the commercial form of toy transformer may be either too expensive to buy or too difficult to make from the semi-occasional experimenter's viewpoint. The simplest solution of the difficulty is to operate whatever apparatus is used in series with an incandescent lamp.

Those fortunate beings who have workrooms of their own can readily wire up a circuit arranged to place one or more lamps in series with a pair of terminals. Those whose operations are confined, however, to a "den," a back room or the dining-room table in an apartment, must needs give some attention to appearances or the convenience of other members of the household.

Under such circumstances the requisites are that the apparatus may be connected in a moment, and when disconnected with the same celerity shall leave no evidence of its use. After some experimenting the following plan was adopted as fulfilling the conditions and costing next to nothing to produce:

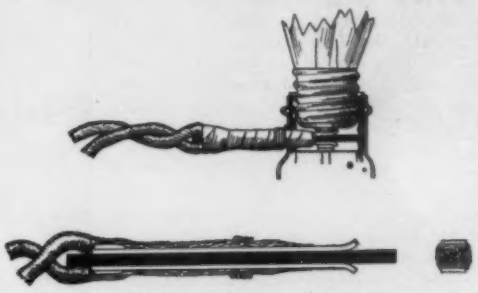
Take an ordinary lamp socket with a key, and measure the distance inside the receptacle from the central contact button to the outer edge. This dimension (we shall call it *A*) is usually about ¾ inch. Measure from the edge on the outside of the socket to a point ⅛ inch less than *A*. With this point as a center, drill a ¼-inch hole clear through the shell, insulation and threaded bushing to the inside of the socket.

Cut a piece of fiber 2½ inches long, 3/16 inch wide and 3/32 inch thick. Cut two pieces of sheet brass or copper, about No. 20 gauge, 2 inches long and 3/16 inch wide. Bare the ends of a suitable length of common electric lamp cord and solder each end to one of the strips of metal. Then lay a strip of metal on each side of the fiber strip so that the fiber projects just 5/16 inch beyond the ends of the metal strips. The tip of each strip should be bent up at a slight angle, as shown. Hold the three strips firmly in this position and wrap them carefully with friction tape from the soldered joints to a point just 5/16 inch from the ends of the metal strips. Taper the wrapping back to about ⅞ inch from the end of the fiber; then lay on friction tape until its diameter is a little less than ¼ inch.

This operation of wrapping with tape must be done very carefully, very tightly and very evenly. The soldered joints should be well covered. When finished the wrapping of tape should be given a good coat of shellac. A few turns of wire are wrapped about the body of the plug as a stop to indicate when the plug is properly inserted in the socket.

This plug is used by pushing it into the ¼-inch hole drilled in the side of the socket as far as it will go—that is, until the end of the fiber touches the opposite wall of the socket. Then when a lamp is screwed into the socket one of the metal strips of the plug connects with the end contact of the lamp, the other with the center contact of the socket. The result is that the cord connected to the plug is in series with the lamp, and appropriate apparatus may be connected to the other ends of the cord. By unscrewing the lamp slightly, the plug may be withdrawn and the lamp screwed home in the usual manner.

At 110 volts, an 8-candle power lamp passes about ¼ ampere; a 16-candle-power ½ ampere; a 32-candle-power one ampere. This amount will suffice for many interesting experiments. Of course, the voltage is not



Handy series current tap.

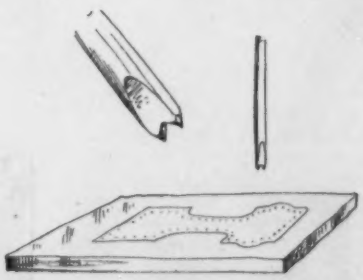
actually reduced by the presence of the lamp in series, but the effect is the same. For example, a small motor with a resistance of 10 ohms and calling for one ampere would need 10 volts to receive its proper current. In series with a 32-candle-power lamp it would get one ampere, and so would operate as though on a 10-volt circuit.

The points of precaution to observe are: The exposed ends of the metal strips must be so short that it is impossible for them to connect or short circuit the two contacts of the lamp—that is, the metal bushing and the central button. The plug must always be pushed into the socket as far as it will go. When in this position the point where it passes through the shell of the socket must be thoroughly insulated by its tape wrapping. The ends of the metal contact strips must be bent up so that when the lamp is screwed down upon them the plug is virtually locked into the socket. And last of all, the plug should never be inserted or withdrawn while the current is on. In order to meet some of these conditions, it may be necessary to vary the dimensions given, as all sockets are not alike.

A Double-pointed Prick Punch

By Albert F. Bishop

IN cutting through sheet metal that is a little too thick for the cold chisel, the mechanic generally lays out the work with a prick punch, and with a small drill makes a row of holes along the scratch line that outlines the work. Now the double-pointed punch will lay out the line of drilling in much less than half the time and much more accurately. The double-pointed punch is appreciated when the workman is doing his drilling. He can start in and proceed with it without any of the interruptions that follow the use of the single-



The double-pointed prick punch.

point. The double points overcome the difficulty of getting the points truly spaced. In using the double-pointed punch, simply insert one point in the punch mark that has already been made, and the blow of the hammer makes the next, and so on.

Workshop Note

To Stop a Leak in a Gage Cock.—Take the gage cock apart and thoroughly clean the seat and stem of the valve. Take a dowel pin and turn to the size of the stem under the seat. Push the plug or dowel far enough down for the babbitt to grip the side of the stem below the seat. Then pour in sufficient babbitt metal to cover the seat about one-eighth inch. Now countersink the babbitt to form a new seat for the stem, but do not cut it down to the brass or it will cause a leak again. The seat should be bored only just enough to provide a good fit.

What Inventors Are Doing

Simple Patent Law; Patent Office News; Inventions New and Interesting

Sinkable Manholes for Pipe Sewers, Etc.

By Our Berlin Correspondent

IN order to provide access to the multifarious lines of underground pipes such as sewers, water pipes, gas pipes, cable conduits, etc., that form a dense network below the pavement of our cities, there are frequently installed at certain intervals vertical shafts terminating on the sidewalk in cast-iron lids. Whenever there is a need for inspecting the conduit, this lid is simply lifted and the man makes his way down below the surface. While avoiding the necessity of taking up the pavement, an act which would interfere with the street traffic, these vertical shafts, opening as they do suddenly in the midst of the sidewalk, are bound to prove a danger to passers-by.

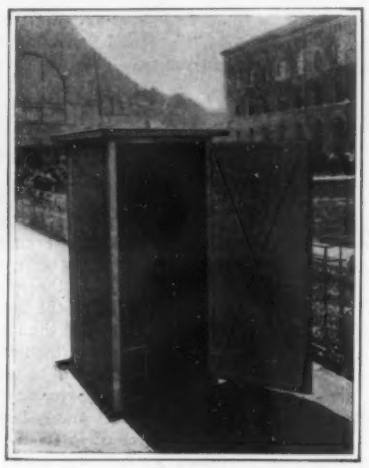
A German engineer, Mr. K. Savelsberg at Aix-la-Chapelle, has therefore designed the sinkable manhole represented in the accompanying illustrations. This, as constructed by Messrs. Ados, Ltd., is some kind of iron sentry box or cabin, sunk into the ground, which at its top carries a corrugated plate that under normal conditions is flush with the surface of the sidewalk. Whenever there is some work to be done in the shaft, the whole sentry box may be screwed up single-handed by a man turning a screw-jack.

The whole shaft manhole, as constructed by the same firm, is balanced by counterweights. The screw-jack rotates a pinion gearing with two beveled wheels fixed on two shafts. A Gall chain leads from one of these shafts to a toothed wheel at the other side of the sentry box, thus insuring a uniform rising of the last. After opening the door with a key, the shaft is ready to be entered by the men, after which the door can again be locked from the inside, leaving only a closed rectangular sentry box in the street, which eliminates any risk to passers-by, while preventing any rain from entering the interior of the shaft.

When their work in the interior of the shaft is done, the men again come up to the surface and after opening the door from the inside, get out of the sentry box which, with its door locked, is again lowered into its underground position.

This arrangement will also be substituted to advantage for the watertight tents generally used by electric companies.

Lifting up an iron cabin through a manhole.



The cabin lifted into position for descent of workmen.

A Syllabic Typewriter

By Dr. Alfred Gradenwitz

NEITHER typewriting nor handwriting can be said to be really adequate means of recording speech, every sound or syllable formed by a single emission of the voice having to be put down letter by letter. While being more rational in this respect, shorthand, which is based on phonetic laws and a simplification of letters, cannot be regarded as an altogether satisfactory process either, and only constitutes an ingenious intermediary. In order to be both practical and rational, a writing process should allow *all the letters* composing a sound or syllable to be recorded *simultaneously*, in their usual form and their correct spelling. While this is not within the reach of handwriting, the advent of type or mechanical writing has in theory made the solution of the problem possible. In fact, a typewriter, which like a piano, comprises a system of keys and type-levers, could very well be made to strike, not a fixed point but several consecutive points, corresponding to the different letters of the syllable, thus allowing these letters, by simultaneously actuating a number of keys, to be printed in a single operation, in the same way as musical tunes are produced by simultaneously striking several keys on the piano. However, the mechanical difficulties encountered in this connection are so many and so serious that all previous inventors of syllabic typewriters, so called, had to content themselves with providing, in addition to the ordinary keys of the typewriter, a number of types corresponding to some of the most usual syllables.

A French journalist, M. Paul de Carsalade, living in Brussels, has bestowed many years of laborious work on the solution of this problem, the importance of which was brought home to him during the discharge of his professional duties. Realizing however the inadequacy of his mechanical training, he, for some years, spent all his evenings and leisure hours in workshops and over engineering books, so that at the end of that time he could solve not only every one of the constructional difficulties previously met with, but incidentally he had become a full-fledged mechanical engineer, thoroughly equipped for exchanging his journalistic pursuits for an industrial career. The principle however underlying his solution of the syllabic typewriter problem is briefly summarized in the following.

Each syllable is considered as a vowel preceded and followed by a variable number of letters, and the arrangement of these is controlled in every language by phonetic laws according to which certain letters always occupy given positions in regard to the vowel forming the basis of the syllable. If accordingly all the syllables of a language be decomposed, it will be possible to distribute the various letters of the alphabet into a certain number of groups corresponding to their position in the syllable. The vowel of any syllable would thus be found in the central group (group B). Another group preceding the former and called group A^1 would contain the letter immediately preceding this vowel, and a group A^2, the letter preceding in the syllable the letter of group A^1, etc. In a similar manner will be found in a group P^1 following the group of vowels, the letter which in the syllable comes immediately after the vowel, and in successive groups P^2, P^3, P^4, the letters immediately following the preceding.

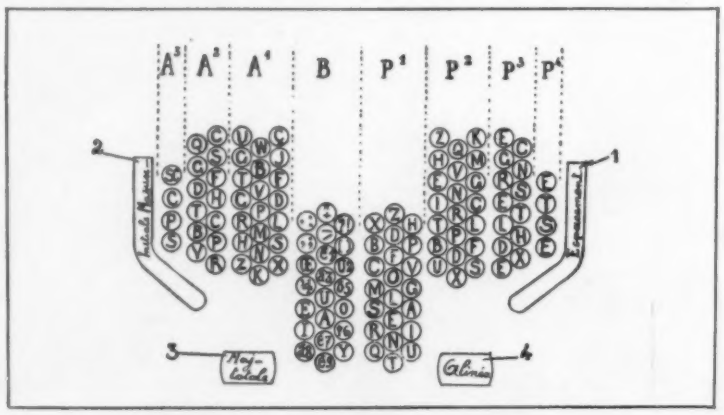
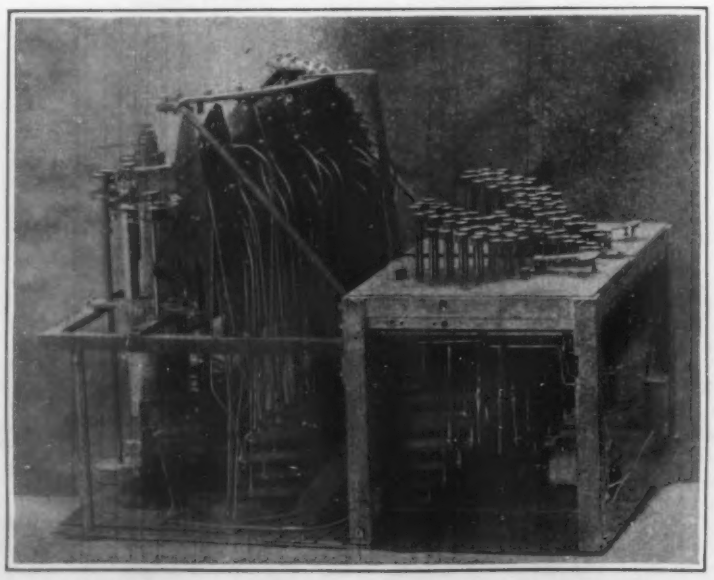


Diagram of the keyboard of the syllabic typewriter.



Model of a syllabic typewriter's system of keys and type-levers.

The arrangement of these groups has so far been worked out only for use in the French language. On account of practical identity in spelling of so many English words with their French equivalents and the greater simplicity of Anglo-Saxon elements, the French keyboard would however seem to be immediately suitable for English and in any case the arrangement of groups in these two languages cannot be very different.

A careful investigation has shown the number of groups in the French language to be 8, viz., group B comprising all the vowels, 3 groups, A^1, A^2, A^3, for the letters preceding the vowel, and 4 groups, P^1, P^2, P^3, P^4, for the letters coming after the latter.

If these different groups of letters be arranged on a keyboard in the following order,

$$A^3\ A^2\ A^1\ B\ P^1\ P^2\ P^3\ P^4,$$

this keyboard will allow all the letters of any syllable to be written simultaneously. In order, e.g., to write the word "CHLORE" (chlorine), the letter C would have to be looked for in the group A^3, the letter H in the group A^2, the letter L in group A^1, the vowel O in the group B, the letter R in the group P^1 and the terminal letter E in the group P^2.

As seen from the accompanying figure, the extreme groups contain only a very few letters; each of the groups A^3 and P^4 thus comprises only 4 letters. The groups A^2 and P^3 each comprise only 13 and the four central groups each about 20 letters. The same group may contain several times the same letter, thus facilitating the operation of the keyboard, each group of which is controlled by a given finger.

The paper-feeding mechanism which enables the paper to move on through a distance proportional to the number and the position of the letters struck simultaneously is extremely ingenious and of remarkable simplicity. The syllabic typewriter also comprises a shift-key for use in producing capitals and a special key controlling the spacing of letters. The typewriter can be operated both syllabically and by striking letter by letter, provided each letter be chosen from the proper group. Their order is by the way quite rational, the keys of the keyboard being struck successively from left to right in each syllable in the same manner as the letters are formed in handwriting.

In addition to the usual mechanisms of ordinary typewriters, the syllabic typewriter, however, contains a number of further improvements, for example, an attachment for returning automatically to the beginning of the following line. This attachment is wound up automatically when there are only seven spaces left at the end of the line and is tripped by the following rise of keys. The machine by self-regulating action then places a hyphen at the end of the syllable, if the word be divided by the end of the line, as in this case the spacing key is not operated.

According to the inventor's experience, a very short training suffices to make one proficient in the operation of the syllabic typewriter. Some girls having no knowledge of typewriting thus were able after only three months' practice, to write at a speed of more than 100 words per minute. This speed obviously requires only a very limited striking speed. In order to write a

French word on the ordinary typewriter, five strokes are required as an average. With the syllabic typewriter however, one and a half strokes are sufficient, that is to say, 150 strokes for 100 words, which corresponds to the striking speed required for writing on the ordinary machine 30 words per minute. A typist writing 50 words per minute on an ordinary machine—which is a very good performance—would be able with the same striking speed to write more than 125 words on the syllabic typewriter.

Another improvement, which is, however, quite independent of the syllabic principle, is a mechanism for controlling at will the spacing between the lines.

Prize for Marine Life-saving Device

ON behalf of the United States Steel Corporation, Judge Elbert H. Gary has presented to the American Museum of Safety the sum of five thousand dollars toward obtaining a collection of the best devices for saving life at sea, as a permanent exhibit for demonstration and study, free to the public. Early next month Dr. W. H. Tolman, director of the museum, with its safety inspector, will go abroad to attend the International Conference of Accident Prevention at Milan, and to study the best European methods for life-saving at sea, and the prevention of the injurious effects of occupational diseases.

The policy of the museum is now being guided by Mr. Arthur Williams, who has just assumed its presidency, succeeding Mr. Philip T. Dodge, who felt obliged to withdraw on account of ill health and absence from the country. President Williams announced another gift of five thousand dollars from an "Unknown Friend" for research work in connection with industrial poison. Dr. Charles A. Doremus is chairman of this section of the museum's activity. The public is not only invited to visit the museum at 29 West 39th Street, between 9 A. M. and 5 P. M. every day to study its collection, but in addition, its jury on exhibits requests inventors and anyone else with practical ideas for life saving at sea to submit them to the museum.

Hinsdill Parsons

AS the result of an automobile accident, Hinsdill Parsons, vice-president and general counsel of the General Electric Company, was instantly killed near Albany, N. Y., Sunday afternoon, April 28th. Although but forty-eight years of age, Mr. Parsons had shown himself to be one of the ablest corporation lawyers in the country. For nearly a dozen years he has had charge of the Law Department of the General Electric Company, and his abilities have been well proven in the solution of the many perplexing legal problems which naturally arose in the development of this rapidly growing industry.

Hinsdill Parsons, a son of the late Mr. and Mrs. J. Russell Parsons, was born in Hoosick Falls, February 10th, 1864, and received his higher education at Trinity College and at the Albany Law School, graduating from the latter in 1885. Four years later he was appointed patent attorney for the Walter A. Wood Harvester Company of Hoosick Falls. He became associated with the General Electric Company in January, 1894, and in April, 1901, he was elected vice-president.

As head of the Law Department, Mr. Parsons directed the legal affairs of the company and was assisted at the Schenectady office and in New York by a large staff of lawyers.

Notes for Inventors

One Senator's Views on Patent Fees.—The Patent Office has had, in the past, as it has now, some loyal supporters in the halls of Congress. In a speech before the Senate in March, 1884, Senator Orville H. Platt, of Connecticut, referring to the governmental patent fees, proceeded to say that—

"A tax upon inventors which produces more than enough to pay the current expenses of the office is simply shameful. It is a tax upon knowledge, a tax on invention, a tax which in itself is as iniquitous and abominable as a tax upon authors or scientists would be. Still I am compelled to say that I do not want the fees paid by inventors reduced until the Patent Office becomes a separate department. I want this glaring inconsistency of the inventors of the country paying the expenses of that branch of the government and furnishing the government from $300,000 to $500,000 annually in addition to continue until its voice shall be heard through the land in favor of the establishment of the Patent Office as an independent department. . . .

The agricultural department is the daughter of the Patent Office, but we have taken the daughter away from her mother; we have built her a fine house and furnished elegant surroundings; we have given her costly and fashionable clothing; we pet, I will not say pamper, her; we pay her every possible attention, while the old lady, her foster mother, still scrubs along in the kitchen of the Interior Department, and is never noticed except when she deposits the surplus of her daily earnings in the treasury for the benefit of the rest of the family."

A New Talking Machine Disk.—It is reported that a Moravian has recently perfected a glass talking machine disk to supplant the composition one now generally used. Many advantages are claimed for the new glass disk.

The Biggest Issue of Patents.—The issue of patents on Tuesday, May 7th, 1912, was the largest for several years and included 842 patents (mechanical, chemical and process), 2 reissue patents, 47 design patents and 142 trade-mark registrations.

New Fire Fighting Apparatus.—In patent No. 1,023,141, H. W. Eisenbise of Reading, Pa., provides a self-propelled vehicle having a water pump and a chemical reservoir supplied with a suitable chemical fire hose independent of the water fire hose, and arranges to divert the flow of chemical solution and direct it through the outlet pipe with the water from the water pump, thus enabling the use of water alone or of chemical fire extinguisher alone or the combination of the two in a single discharge.

Legal Notes

Addition is Not Invention.—In Long v. Noye Manufacturing Company, 192 Fed. Rep., 566, the court affirms the well recognized principle that the addition of something to what is shown by a patent does not avoid infringement of the patent if the substance of the invention is taken and the principle and mode of operation is retained.

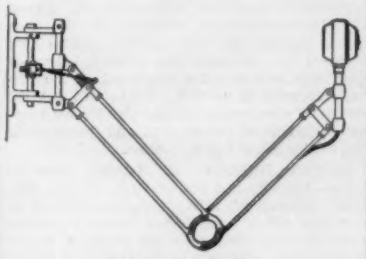
Recent Patent Decisions.—The Court of Appeals of the District of Columbia in decisions handed down on April 1st, affirmed the decision of the Commissioner of Patents in the Patent Appeals of Collis against Quenzer, Coursan against O'Conner, Betz against Kukkuck, LeBrou against Nix, in re-application of Carl A. von Welsbach, in re-application of Meyer Brothers Coffee and Spice Company, Bradley against Meggett, in re-application of Gustave Wenzelman, Sears against Brakeley and in re-application of Egbert H. Gald. At the same time the Court reversed the decision of the Commissioner of Patents in the following cases: Jackson Corset Company against Cohen, Paffenharger against Olson, Becker & Co. against Gambrill Manufacturing Company, Summers against Clark, Gambrill Manufacturing Company against Waggoner-Gates Milling Company and in re-application of Meta Mattulath. In the Mattulath case wherein the decision was handed down by the Chief Justice the application filed by Hugo Mattulath now deceased, January 8th, 1900, is reinstated on the application of his widow. The invention involved is a flying machine and because of his failure to prosecute the application, became abandoned October 3rd, 1903. The invention is said to embody wing-tip flexing devices and the effect of the reinstatement of the application upon issued patents claiming the subject, will be watched with interest.

RECENTLY PATENTED INVENTIONS

These columns are open to all patentees. The notices are inserted by special arrangement with the inventors. Terms on application to the Advertising Department of the SCIENTIFIC AMERICAN.

Electrical Devices.

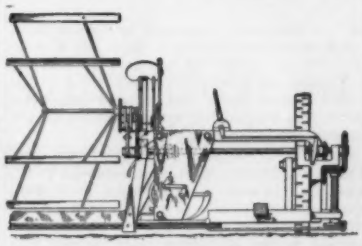
ELECTRIC SWITCH.—G. H. TAYLOR, P. O. Box 1077 Helena, Mont. This device may be used in lieu of a foot switch or in connection therewith for supplying current to the motor of an electrical dental engine. The switch operates automatically as the bracket upon which the motor is carried is extended into operative position or is pushed back into inoperative position, thus relieving the operator of the necessity of manipulating the switch every time the electric circuit, which actuates the motor, is opened or closed. It may be readily attached to brackets of electrical dental engines in common use. The engraving gives a side view of an electrical dental bracket equipped with the switch showing bracket extended.



ELECTRIC SWITCH.

Of Interest to Farmers.

GRAIN HARVESTER AND BINDER.—A. L. POWELL, Alamo, Tenn. This machine insures proper cutting of grain without undue binding or straining of cutter or sickle bar, conveys cut grain on the level from traveling platform to binder table, and to bind the grain thereon, keeps the butt ends of cut grain in alinement, insures formation of a smooth sheaf, permits adjustment of the reel for accommodating and binding the short, long or tangled grain, and simplifies the machine and reduces the weight thereof, for conveniently drawing the machine over soft and rough ground without undue exertion of the draft animals. The illustration shows a front elevation of the machine.



GRAIN HARVESTER AND BINDER.

Of General Interest.

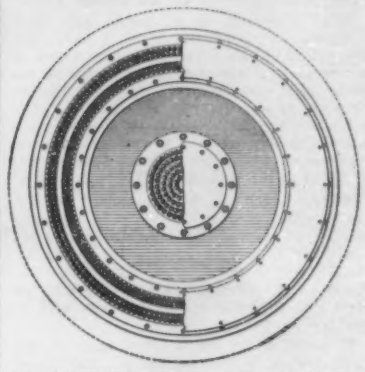
SPREADER FOR REINS.—J. A. TYCHON, 610 Cloquet Avenue, Cloquet, Minn. This spreader is especially adapted for use with double harness, instead of the usual ones, and is designed to prevent the lines from becoming caught beneath the end of the pole. When horses swing their heads this is very liable to happen and compels the driver to dismount, when he has little control over the team, and there is danger of the teams running away. The improvement positively prevents any such occurrences. The illustration is a perspective view of the attachment in use.

SPREADER FOR REINS.

SHOW CASE.—T. E. LINDSAY, Jackson, Tenn. This case is for use in stores and other places, and is arranged to display and store cigars, and other commodities or articles, and permits the person in charge to swing the glass front into open position for giving access to the articles so as to allow the customer to make the desired selection without the one in charge disturbing the articles.

HAIR CUTTER.—S. PERRONE. LOUISA PERRONE, 305 West 146th Street, Manhattan, N. Y., administratrix to S. PERRONE, deceased. The aim here is to provide a cutter by means of which an individual can cut his own hair quickly and easily, without any assistance, which permits the hair to be cut uniformly and as short as desired. Its use requires no special skill.

BALL BEARING PIVOTED AND BALANCED DEVICE.—L. BADGER, R. F. D. No. 43, Lincoln, Cal. More particularly this invention comprises a construction adapted to structures which are rotatably pivoted, and such as are generally found in drawbridges, turntables or hoisting cranes. All bearing contact is made through the inter-position of balls which are freely rotatable along the various steps as the rotatable member is turned and that there is no contact save this rolling one, which thereby lessens the friction and increases the efficiency of the construction. The engraving shows a horizontal sectional view of the device.

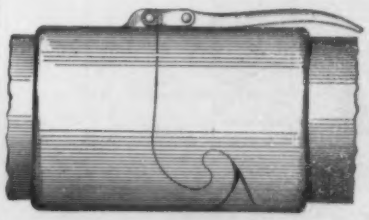


BALL-BEARING PIVOTED AND BALANCED DEVICE.

COMBINED CIGARETTE BOX AND MATCH HOLDER.—A. Q. WALSH, care The Stickney House, Williamsbridge, N. Y. This invention provides a combined box and match holder, arranged to hold cigarettes and matches in such a manner that the matches are not liable to contaminate the cigarettes, and both can be removed from the box and the holder independent one of the other, and only at the time the cover is open.

Hardware and Tools.

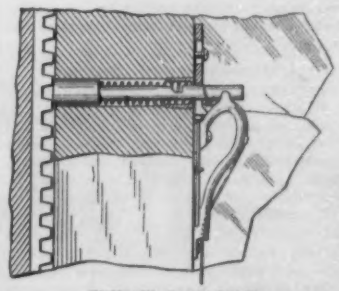
PIPE OR HOSE COUPLING.—P. R. BRADLEY, 652 Monroe Building, West New York, N. J. This coupling is arranged to permit convenient and quick coupling and uncoupling of the members of the coupling and to prevent leakage of the liquid passing through the coupling. For this purpose, the coupling is formed of male and female coupling members having a separable hinged connection lying within the peripheral faces of the members, and a cam lug mounted on one coupling member and engaging a lug on the other coupling member. The engraving presents a side elevation showing the members of the coupling in closed and locked position.



PIPE OR HOSE COUPLING

HOLDER FOR TOILET PAPER ROLLS.—J. NEDERLAND, 119 Bay 22nd Street, Bath Beach, Brooklyn, N. Y. The inventor provides a holder adapted to receive paper rolled on hollow tubes of various interior diameters; provides a lock which may be opened after the paper has been exhausted from the tube; and provides a holder whose supporting brackets automatically spread to dispose the holder to receive a renewal roll.

WINDOW SASH LOCK.—A. E. HANSON, Mason City, Iowa. Among the principal objects of this invention are: to provide a sash lock which permits the window to be locked in a closed or partially opened position for purposes of ventilation; and to provide a lock which is simple, efficient and durable in form and



WINDOW SASH LOCK.

construction. The engraving herewith shows a vertical section taken through the center of the sash stile, showing the bolt and operative connections mounted on the upper sash of the window and in locked position.

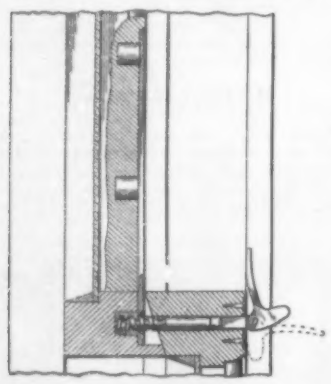
RINSING FAUCET.—R. M. ELKINS, 4466 Fairfax Avenue, St. Louis, Mo. This invention provides a novel construction of washer, so constructed that the rinsing device for use in numerous hollow utensils will not interfere with the normal operation of the faucet proper and the latter may be operated for its usual purpose independently of the rinsing device.

TURF CUTTER.—F. A. YOUNG, care of J. P. Lyston, care of C. W. Ward, 2 Merchants' Row, Rutland, Vt. This invention refers to cutters for turf and sod. It is pushed by the handle and used chiefly to turn the turf at the edges of lawns. When an adjustable plate is removed the machine may be used as a sod cutter, but when secured it cuts grass at the lawns' edge and cuts clear of the lawn so that it can be swept up easily.

WIRE CLAMP.—G. M. ANDERSON, P. O. Box 313, Gordon, Neb. This device is especially adapted for use with the wire stretcher in Mr. Anderson's co-pending application, Serial No. 621,219, and designed for firmly gripping the wire without any possibility of accidental release, yet so arranged that the wire may be quickly released.

WINDOW SASH LOCK.—S. C. SLADDEN, 305 Fifth Avenue, Manhattan, N. Y. This invention provides a lock having a plurality of service positions; provides a lock to draw sashes toward each other, to prevent admission of cold air or dust, and to overcome any tendency to rattle, present in the sashes and frames thereof, provides a lock, inconspicuous; and provides a lock the master member whereof is removable, to prevent accidental release or disadjustment thereof.

WINDOW SASH LOCK.—S. C. SLADDEN, 305 Fifth Avenue, Manhattan, N. Y. This invention provides a lock having a plurality of service positions; a lock, positive and rapid in operation; a lock to draw the sashes toward each other, to prevent the admission of cold air or dust, and to overcome any tendency to rattle, present in the sashes and frames there-



WINDOW SASH LOCK.

of; a lock that is inconspicuous; and a lock, the master member whereof is removable, to prevent accidental release or disadjustment thereof. The device shown in the illustration is a vertical section of fragments of window sashes, showing the meeting rails of said sashes, provided with a lock constructed in accordance with the present invention.

GATE OR DOOR LOCK.—E. J. TANGEMAN, Keystone, Iowa. This device will engage a portion of the door, and will pull the door tightly shut, thereby preventing sagging or rattling. The device includes a lever and a hook, the said lever and hook being so connected that by manipulating the former the latter will be caused to move in such a way as to insure the positive locking of the doors.

Heating and Lighting.

LIGHTING FIXTURE.—J. T. ROBB, care of Mitchell Vance Company, 507 West Twenty-fourth Street, New York. The principal object here is to provide a mounting for a lamp, the former being provided with movable members especially adapted for supporting a pendent sphere, another element carried by the mounting being adapted to position the sphere on the mounting.

Household Utilities.

ATTACHMENT FOR KITCHEN CABINETS.—F. E. P'POOL, Snyder, Texas. The object in this instance is to provide a cabinet having a plurality of driven shafts, connected with conveyers and rotating members, and a driving shaft adapted to be moved relatively to the driven shafts, for engaging and driving any one of the said driven shafts.

PILLOW.—T. E. DROHAN, 212 Glenwood Boulevard, Schenectady, N. Y. The pillow may be used either with or without a cushion, and the invention comprehends a structure whereby open space is provided beneath the person's head, this space being adapted to contain a hot or cold water bottle, or a bag of cracked ice if desired.

RECLINING PORCH SWING.—E. R. KING, R. F. D. No. 3, Henry Station, Tenn. This swing is adapted to be suspended from a porch ceiling or like place. It may be easily knocked down into small compass when not in use or when shipping, and wherein the inclination of the back may be changed with respect to the seat and locked in adjusted position, and wherein the foot support is moved with the back, but in opposite direction.

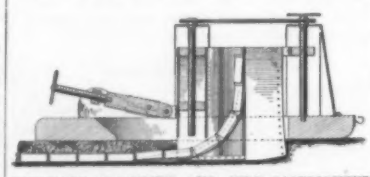
Machines and Mechanical Devices.

ELEVATOR.—W. A. CRICHTON, Paris, Ontario, Canada. The purpose here is to provide a construction which takes up very little floor space, the elevator being constructed with guideways having switches which are operated by guide members connected with the forks, for directing companion guide members in the guideways.

TRENCH DIGGING MACHINE.—J. LAPIN, 172 Hamilton Avenue, Brooklyn, N. Y. This trench digging and soil cutting machine cuts a trench by positioning two parallel knives on a carriage, whereby the movement of the carriage forward on portable tracks will cut the outline of the trench. Means provide for varying the width of the trench; and dismounting the machine for transportation.

DIPPER DREDGE.—E. KREHER, care of Tampa Foundry and Machine Co., Tampa, Fla. This improvement refers more particularly to a dredge which comprises a boom, a cannon pivotally associated with the boom, a dipper stick slidable relatively to the cannon, a dipper carried by the stick, and means for actuating the dredge.

DITCHING MACHINE AND TILE DISTRIBUTER.—A. E. HANSON, Mason City, Iowa. This invention relates to the laying of pipes or hollow tiles in ditches, and its object is to provide a new and improved ditching machine

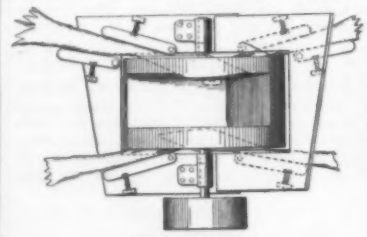


DITCHING MACHINE AND TILE DISTRIBUTER.

and tile distributer, arranged to readily form a ditch in the ground and to place the tiles or pipes into the bottom of the ditch for convenient forming of the tiles or pipes to form a line of such tiles or pipes. The accompanying illustration is a longitudinal central section of the machine and distributer.

SELF ADJUSTING ATTACHMENT FOR PIANO PLAYERS.—T. H. CABASINO and T. W. VRANA, 1321 Avenue A, Manhattan, N. Y. This invention has reference to a new and improved attachment for a piano player, whereby the openings in the perforated sheet or roll will always be maintained in proper register with the corresponding openings in the tracker.

GRAFTING MACHINE.—A. ROBERTSON, Harrison Lake Hatchery, Harrison Hot Springs, B. C., Canada. The purpose here is to provide a machine more especially designed for use in nurseries and the like, and arranged to cut the graft or scion diagonally with a shearing cut to prevent bruising or injury to



GRAFTING MACHINE.

the graft. For this purpose use is made of a rotary cutter head provided with beveled knives, a table for the grafts to rest on, and guides on the table at an angle to the cutting edges of the knives to guide the grafts. The machine is pictured herewith in a plan view.

MULTIPLE RECORD PHONOGRAPH.—R. B. SMITH, 407 W. 57th Street, New York. This inventor employs means for carrying a pluraHty of records, say four, six or more, each of which is adapted to be brought into co-operative relation to a reproducer so that the record will remain in place and be rotated axially while the reproducer travels along said record, after which the next record is brought into position with relation to the producer, so that the aforesaid operations may be repeated, and so on throughout the number of records used in the machine.

TRIGGER MECHANISM.—J. M. RUSSELL, care of King-Kaylor Co., Bristol, Tenn. This improvement is in the trigger mechanism of double-barreled two-trigger guns, and the inventor's object is to produce a simple, cheap and efficient device whereby the discharge of either or both barrels may be caused by pulling but one trigger.

SHUTTLE CHECK.—P. F. MARCANTE, 388½ Allen Street, Allentown, Pa. An object here is to provide a gradual brake or check which will positively stop the shuttle at the proper point, irrespective of weather conditions, so that the loom can be operated at high speed, producing more and better cloth in a given time.

COMPRESSED AIR MACHINE.—J. G. SAURENMANN, Box 907 El Paso, Texas. This improvement refers to an automatically acting machine where a reciprocating action is desired. An object is to provide a machine which will be automatic and positive in its action, which may be operated with the minimum amount of compressed fluid, and which has relatively few parts that might get out of order.

PLATE HOLDER.—F. L. SCHLEY, 35 Beekman St., New York. This invention relates to a new and improved holder for securing in position plates of varying sizes. An object of the invention is the provision of means for holding plates of various sizes, which can be adjusted without leaving any openings or slots into which the plate can sag.

AUTOMATIC LEAF TURNER.—J. A. ANDREW, care J. H. Austin, 1118 Langley Street, Victoria, B. C., Canada. The purpose here is to provide a mechanism which may be easily attached to the frame of a piano or any other suitable support such as a music stand, there being a plurality of means for holding the book, or sheets of music, in position, together with elements engaging the leaves whereby they may be turned.

Prime Movers and Their Accessories.

MAGNETO FOR INTERNAL COMBUSTION ENGINES.—A. DURBIN, 90 Floral Street, Newton Highlands, Mass. Mr. Durbin's invention has reference to a magneto device to supply ignition current to ignite the charges in the cylinders of an internal combustion engine. The main parts of the magneto are attached directly to the fly-wheel of the engine, and are operated thereby.

SYSTEM AND APPARATUS FOR STARTING INTERNAL COMBUSTION ENGINES.—J. C. BOYLE, care P. Burns & Co., Calgary, Alberta, Canada. Among other provisions this inventor supplies a system for storing gas under compression to be admitted to an engine cylinder when the mechanical parts thereof are in position to receive an operative explosion therein; a means for introducing gas under pressure to the cylinder of an engine of the type specified when the piston thereof receives the explosion impact; and means for insuring richness of gas when delivered from the compression system.

Railways and Their Accessories.

CAR WHEEL.—F. LINDBLAD, 501 W. 133rd Street, Manhattan, N. Y. This invention deadens noise caused by the passage of metal carrying-wheels over metal rails; provides a two-part carrying-wheel having a shoe separated from the body of the wheel by yielding cushions; and provides means for conducting electricity from the shoe to the body of the wheel, to complete the electric current through the rail and wheel.

AUTOMATIC CONTINUOUS RAIL JOINT.—C. TROUP, Watseka, Ill. There is provision here of a connection practically independent of the rail, so that no change is required in construction of the same, and wherein a supporting surface is provided at each joint between the rails and flush with the upper face of the rail tread, for engagement by the wheel to carry the wheel over the joint.

TUBE CLEANER.—J. F. RILEY, 6-12 South Street, Charleston, S. C. This device makes it unnecessary to take out the brick arches for cleaning the tubes. The cleaner may be operated by one hand, and the valve for admitting or cutting off compressed air may be manipulated by mere pressure of the fingers of the hand which holds the device without shifting the hand's position.

DUMPING CAR.—V. KOUNS, Route 1, Mokane, Mo. Among the objects this invention has in view are: to provide means operable by the traction motor whereby one or more cars of a train may be selected for dumping, or be omitted at any station; and to provide means to prevent the cars overturning when dumping.

RAILROAD TIE AND LOCK.—V. A. CONKLIN, 38 East 25th Street, Bayonne, N. J. This device is a steel railroad tie and lock. An object of the invention is to provide a device whereby railroad rails are accurately positioned apart and locked in this position. This is attained by positioning beneath the parallel rails a series of parallel ties arranged transversely beneath the rails. Each alternate tie has a projecting rim to embrace the outside of the base flange of the rails, while every other tie has a projecting rim to embrace the inner end of the lower flange of the rails.

Pertaining to Recreation.

TOY.—G. L. WEBSTER, Midlothian Texas. This invention is an improvement in toys and especially in whirling toys wherein a whirligig is operated by tension of parallel lengths of cord twisted about each other and pulled and released alternately to cause the toy to whirl first in one and then in the other direction, and the invention provides a construction whereby a rattling noise may be caused as the toy is operated.

NOTE.—Copies of any of these patents will be furnished by the SCIENTIFIC AMERICAN for ten cents each. Please state the name of the patentee, title of the invention, and date of this paper.

Alligator Farming

(*Concluded from page 422.*)

The large female alligator lays from fifty to sixty eggs every summer, and the small ones from twenty-five to thirty, and practically every egg will hatch. The eggs are about three times the length of hens' eggs. The female makes her nest with her hind legs in the mud, which becomes a sort of "hot bed," such as a gardener might make, and the natural action of the elements does the hatching. The baby alligator receives no attention from the mother, but is left to hustle for itself. On the various farms large incubators are used to hatch the eggs.

All saurians naturally hibernate in the mud, and consequently require no food from the first of September to the first of May. In captivity in some localities where the winter is warm, such as in southern California, they are kept from hibernating for exhibition purposes, the only effect on the reptiles in consequence apparently being that they show signs of sluggishness or drowsiness, and are therefore fed. Meat constitutes their only diet, and they are given this raw in small pieces. Although it is a fact not commonly known, alligators, and crocodiles also, have no teeth for masticating their food, but swallow it whole. A saurian placed in a pen by itself and given only large pieces of meat, too large to be swallowed, would starve to death. Their jaws are studded with teeth, which overlap, but are intended only for grasping and holding—and a veritable vise is truly formed by these teeth-studded jaws. Throw a large piece of meat into a pen containing several of the reptiles, and an interesting sight is afforded. Two or more sets of jaws close down upon the piece with vise-like grips, and then over and over the bodies of the reptiles spin in opposite directions. This action continues until a piece that can be swallowed is torn or twisted off.

Pontoon Method of Saving Life at Sea

(*Concluded from page 418.*)

itself—an arrangement which would conceal the fact that the pontoon was a separate structure and would give it the appearance of being an integral part of the ship itself.

The problem of securing this pontoon in place would not be so difficult as might be supposed. It could be done in several ways. As a suggestion, the deck on which it rested might be provided with several longitudinal rib-like projections which would register with corresponding longitudinal recesses, sunk in the outer shell of the double bottom of the pontoon. Both the ribs and the recesses would be tapered in cross section, and both would be provided with bearing strips of bronze or other non-corrodible metal, so as to insure the ready release of the pontoon when the ship went down. These ribs would effectually hold the great weight of the pontoon against lateral movement when the ship was rolling, and the friction of the ribs would be sufficient to prevent longitudinal movement under the much smaller fore-and-aft forces set up by the pitching of the vessel.

If it were deemed necessary, a few holding-down bolts, readily accessible and quickly released, might be added as a further precaution. A double-deck pontoon, with its deck houses of the size shown in our front page engraving, would be sufficient to accommodate, in an emergency, the whole of the passengers and crew of a ship of the size of the "Titanic."

Chinese Queues and the Hair Supply

CONSUL-GENERAL ANDERSON, stationed at Hongkong, has recently taken pains to correct the impression, so widespread in the United States, that the growing tendency on the part of Chinamen to dispense with their queues will have the effect of making false hair cheap in this country. It appears that the queues when cut are never sold, but are always preserved for burial with the owner. Mr. Anderson says that this is an absolute rule throughout South China, as well as in all other parts of the country from which he has been able to secure information on the subject.

The Campaign Against Cancer—Educational, Experimental, and Clinical

ON Wednesday afternoon, April 24th, 1912, at the New York Skin and Cancer Hospital, Nineteenth Street and Second Avenue, a clinical demonstration was given of about fifty patients who have been under treatment by various methods. For a number of years this institution has been making an especial effort to test all the important new suggestions which from time to time come before the medical world for the prevention, palliation, or cure of cancer, as well as those which seem to offer a hope of solving the mystery of the cause of this disease.

Among the methods now being tested by the hospital are certain of the new applications of high-frequency electrical currents. At considerable expense this institution has recently installed the de Keating-Hart "Fulguration" apparatus, for the treatment of cancer patients by so-called "artificial lightning," and the apparatus for the application of the Doyen "electro-coagulation" and the Nagelschmidt "diathermy" methods for treating the same class of patients. At the demonstration on Wednesday many patients were presented who had been seemingly benefited by these methods.

"Fulguration" consists in the application of a monopolar current, with long sparks of high frequency and high tension. Unlike some of the other methods of employing high-frequency electricity, "fulguration" is not supposed to act upon the cancer itself, but upon the "soil" upon which the cancer develops. It causes no burning of the tissues upon which it is applied, and it is employed only after as thorough surgical removal as possible of the visible evidences of cancer. The spark is from ten to twenty centimeters in length, being delivered from a special electrode through which a current of cold sterilized air passes to the tissues in order to cool them and prevent the possibility of burning. The amperage and voltage vary according to circumstances, source of current, apparatus employed, etc. The fulguration apparatus at the Skin and Cancer Hospital was constructed under the personal direction of Dr. de Keating-Hart, of Paris, who originated the method. With this machine the amperage varies from 300 to 500 milliamperes, and the voltage from 300,000 to 500,000 volts. The sparks are applied for about ten minutes for each ten square centimeters of surface.

According to the theory of de Keating-Hart, this application of high-frequency sparks, after the removal of the cancer, prevents the return of the growth. In cases where it is impossible to remove all of the diseased tissue it seems to lessen the pain and disagreeable odor of cancer.

The "electro-coagulation" and "diathermy," on the other hand, are methods of destroying the cancer cells themselves, and the current, which is bipolar, is applied by special electrodes directly to the cancer itself. It is believed not to injure the normal tissue with which it may come in contact. The Doyen apparatus at the Skin and Cancer Hospital produces a current of about three million oscillations per second, and of a strength of from 10 to 15 amperes. Its purpose is to coagulate the diseased tissue, and this it is said to do to a depth of from 5 to 8 centimeters in from one to two minutes.

Another effect of fulguration, according to its originator, is the rendering of tissue treated more sensitive to X-rays. It is therefore used in connection with another method, introduced by de Keating-Hart and now being tested at the New York Skin and Cancer Hospital, called "thermo-radio-therapy." The principle involved in this method is that X-rays are rendered more active when applied to tissues that have been heated just before, or that are being heated during the application of the rays.

In order to prevent the irritation to the skin caused by the X-rays, the surface of the body through which the rays pass is cooled by means of cracked ice wrapped in cotton, or by wetting the surface and blowing air over it with specially constructed bellows.

The heating of the diseased tissue to be treated by X-rays is accomplished in different ways, according to the kind and location of the cancer. In some cases hot normal salt solution is injected into the cancer; in others, as in hollow organs, irrigations with hot water are employed just before the X-rays are applied, or, if the cancer be in the stomach, hot broth may be taken; while in still others heat is applied by means of an electric current passed through needles which are thrust into the tumor, or through a special flat electrode placed over the surface to be heated. This method is applied only in very advanced cases, where it is too late to accomplish a cure by surgical means.

Not only is the New York Skin and Cancer Hospital doing excellent service to humanity by testing the various new methods of treatment as they arise, but by giving publicity to the most important established facts about cancer. Year after year, by these clinical lectures and demonstrations, and by published articles, the hospital has been carrying on an educational campaign which cannot be too highly commended because of the fact that the control of this disease depends in very large measure upon its early recognition. It is also of the utmost importance that the possibilities of prevention be known.

In the clinical lecture of last year, the title of which has been employed by the writer of this article, Dr. Bainbridge made the following interesting statement: "Actual clinical experience, gained from the study of hundreds of cases similar to those presented, has convinced us that a large proportion of severe and perhaps fatal malignant neoplasms may be traced to apparently insignificant and harmless warts, moles, nevi, scars, etc., which are subjected to irritation of one kind or another, and which are easily and completely removable by surgical means.

"Rational attention, by physicians and laymen, to these seemingly inconsequent conditions would undoubtedly tend to lessen the proportion of cases of irremovable and inoperable, and consequently fatal, cancer.

"In the light of our present knowledge concerning the initiation and progress of cancer, no patient should be denied the benefit of early and radical surgical removal.

"Unfortunately, however, there are to be encountered some individuals in the various stages of the disease who absolutely refuse this form of treatment. In these cases, and in those so far advanced that surgery no longer holds hope of eradicating the disease, there is a legitimate field for experimentation. Such new agencies and methods as seem to offer the least prospect of doing harm or of causing unnecessary suffering, while offering the greatest hope of effecting a cure or of ameliorating human suffering, may be employed in these cases."

In accordance with the above statement, there were presented at the clinical lecture on April 24th, many cases showing the results, not only of the methods mentioned above, but of serum, or "autogenous vaccine," of arterial ligation, and other methods.

The campaign against cancer was formerly carried on entirely within the ranks of the medical profession, because of that peculiar code called by physicians "medical ethics;" latterly, however, the warfare has been waged in the open. Various committees on hygiene, medical education, etc., have taken the public into their confidence, so to speak, and now the intelligent layman considers that he has a right to know everything that the medical profession can tell him about cancer, provided that information will enable him to protect himself, his family, or any part of the community, against the inroads of this most terrible disease. For this reason the work being conducted by the New York Skin and Cancer Hospital and Its Committee on Scientific Research, is particularly commendable.

The Zapote Tree as a Source of Chicle

AMONG the numerous natural products abounding in Mexico the zapote tree (*Achras sapota* L.) is among the most valuable. Both the gum and the wood during many years has formed a source of great wealth to a large number of individuals and corporations, which have obtained from the State government concessions to extract the gum. The wood which is called sapodilla, nispero, bully wood, or bullet wood, is very highly esteemed for making furniture, cabinet work, and occasionally buildings. A good deal of the wood has been exported from various ports of southern Mexico as a substitute for mahogany. It is dark, reddish-brown, somewhat resembling true mahogany, and although exceedingly hard when first cut it is easily worked until thoroughly seasoned, when only the finest edged tools have any effect on its flint-like

surface. The wood is susceptible of a beautiful polish, and when thoroughly seasoned shrinks and warps very little. It is so heavy that it sinks rapidly in water, and will remain immersed for many years without being affected in the least. Sharp pointed nails can be driven into the wood only about an inch. Zapote door frames in the ruins of Uxmal in Yucatan are as perfect to-day as when first placed in position.

The zapote tree is of a very slow growth, requiring 40 to 50 years to attain the average height of 30 feet. The average zapote will square from 5 to 8 inches, and occasionally two feet. The trees thrive best on high, rolling land, and although they are found on the lowlands they are inferior in both sap and wood. Continuous tapping does not appear to have a seriously detrimental effect, provided the incisions are not too deep. The magnificent trees are rapidly disappearing, however, because operators are taking no precautions to protect them from the destructive methods of the chicleros (laborers) who cut the trees so deep that they generally die. Trees are known to have been tapped for twenty-five years, but after that time produced only from half a pound to 2 pounds of sap. If allowed to rest five or six years they will produce from 3 to 5 pounds. Trees tapped for the first time will produce from 15 to 25 pounds of gum or sap, according to size. In order to produce 25 pounds a tree would have to square about 2 feet and be from 25 to 30 feet high.

The chicle industry extends from Tuxpam as far as the extreme southern portion of Yucatan, which produces the largest yield, but in quality the gum is inferior to that obtained from the Tuxpam district. The latter gum commands a higher price in the United States, to which it is almost exclusively shipped.

Quantity and value of imports of chicle into the United States from 1901 to 1910, inclusive, are as follows:

Year.	Quantity Pounds.	Value
1901	3,140,768	$ 753,696
1902	4,574,605	936,065
1903	4,282,247	954,389
1904	5,084,580	1,308,540
1905	5,060,166	1,357,458
1906	5,641,508	1,495,366
1907	6,732,581	2,139,204
1908	6,089,607	2,027,148
1909	5,450,139	1,987,112
1910	6,793,821	2,547,339

The chicle season opens early in September, though the yield at this time is often limited, owing to the frequent rains which retard the chicleros in their work. The rainy season is favorable to an abundant flow of sap, provided it is not prolonged beyond October, in which case sap would contain a larger proportion of water, and the loss in condensation would be heavy and the product inferior.

The process of extracting the sap is primitive. Open V-shaped incisions are made in the tree trunks. At the base of each tree a palm or other appropriate leaf is fastened, which acts as a leader or gutter from which the chicle drips into the receptacle placed to receive it. The sap as it flows into the incisions is a beautiful white, has the consistency of light cream, but as it runs down it gradually becomes more viscous, until, as it drops into the receiving receptacle, it is of the density of heavy treacle. When the receptacle is filled it is emptied into a large iron kettle and boiled to evaporate the water, which amounts to about 25 per cent of the sap. As the boiling progresses the chicle thickens, and when it has reached the proper consistency it is kneaded to extract more of the water content, and is then shaped by hand into rough, uneven loaves weighing 5 to 30 pounds. If carefully cooked it is of a whitish-gray shade; if carelessly handled and improperly boiled it is of a dirty dark gray. When prepared with extra care it is of a light pinkish color. The sap freshly extracted will weigh about 7 to 8 pounds to the gallon. It is very adhesive, and is extensively employed for repairing broken articles and fastening leather tips to billiard cues.

Austrian Monopoly of Radium

THE Austrian government has recently bought the only two radium mines at Joachimsthal that were privately owned, thus securing a practical monopoly of the radium output of the world. It is expected that when a new factory at Joachimstahl is in operation the annual yield of radium will amount to 5 grammes, valued at $400,000.

NEW BOOKS, ETC.

THE WHOLE ART OF RUBBER GROWING. By W. Wicherley, F.R.H.S. Philadelphia: J. B. Lippincott Company, 1911. 16mo.; 154 pp.; illustrated.

The title of this little dissertation is somewhat ambitious, but the author has undeniably managed to pack within small compass a great many facts and figures. The varieties of rubber trees, with the diseases that threaten them and the difficulties that surround their successful culture, are described at length, and the preparation of clearings, methods of planting, and tapping systems, are all gone into with thoroughness but in non-technical language. Most of the illustrations are drawn from the plantations of Ceylon, and Americans who have of late years invested in Mexican cultivated rubber will search the essays in vain for any gleam of hope toward the success of their ventures. Perhaps, however, if the "managers" of these Mexican estates had only possessed the knowledge conveyed by the author, the career of the companies might have recorded as great a triumph in raising rubber as it did in selling stock.

THE CORROSION OF IRON AND STEEL. By J. Newton Friend, Ph.D., D.Sc. New York: Longmans & Co., 1911. 8vo.; 300 pp.; with diagrams.

In a series of careful studies—which, after all, show how great an amount of research work is still called for in this important field—the action of air, water, and steam upon iron is traced and explained. Such questions as to whether acid is essential to corrosion, and as to the factors influencing the rate of corrosion in iron exposed to natural forces, are discussed, together with the action of acids, alkalies, salt solutions, and oils. The factors of chemical composition of the material, and of electrical and galvanic action upon it, are also given considerable space and painstaking attention. Footnotes refer the reader to most of the authorities for the conclusions arrived at and the statements made.

THE PAINTER'S ESTIMATOR AND BUSINESS BOOK. By A. Ashmun Kelly. Malvern, Pa.: The Master Painter Publishing Company, 1911. Paper; 91 pp. Price, $1.00.

The author is so well known by his former publications that the present useful pamphlet will be welcomed by the craft of the United States and Canada. Specifications, measuring tools and measuring methods, price comparisons and price-lists, with estimate tables for the paper hanger and the sign painter, comprise the first part of the work. The latter part deals with business methods—bookkeeping, credits, shop management, and business correspondence. Altogether a very helpful compilation.

FORECASTING WEATHER. By W. N. Shaw, F.R.S., Sc.D. London: Constable & Co., 1911. 8vo.; pp. xxvii, 380; illustrated. Price, $5.00.

The author of this book is director of the British Meteorological Office (i. e., the official British "clerk of the weather") and president of the International Meteorological Committee. A personal sketch of him was published in the SCIENTIFIC AMERICAN of August 19th, 1911. The need of a comprehensive work on weather forecasting in the English language has become urgent in the quarter-century that has elapsed since the publication of the second edition of Abercromby's "Principles of Forecasting," to which the book under review may be regarded as the lineal successor. Dr. Shaw has given us the book we were waiting for. Everyone who takes an interest in the weather—and who does not?—will find his work both readable and informing. The author's training as a laboratory physicist does not lead him to write over the heads of the intelligent public; but on the other hand he has produced a book that the best-informed meteorologist cannot afford to leave unread. Any attempt at an abstract of Dr. Shaw's treatise within the limits assigned to the reviewer would merely mislead the reader and detract from the pleasure he will find in a perusal of the book itself. Let us say, as to generalities, that the work is, in the first place, charmingly written, and in the second is absolutely authoritative and trustworthy—with a single trifling exception; on page 4 the author tells us that such lines as isobars, isotherms, and the like are called, generically, "isopleths." The latter term is, we believe, firmly established in the meteorological vocabulary in another sense. (See the article "The Meteorological Isograms" in SCIENTIFIC AMERICAN SUPPLEMENT, November 12th, 1910, p. 316-318.) This book renders a particularly valuable service to the layman—and also to the meteorologist who has not time to keep abreast of the rapidly growing literature of his subject—by presenting a digest of the splendid work done at the British Meteorological Office during the past decade. In this sense it is the product of several members of Dr. Shaw's staff as well as of the director himself. Thus the joint researches of Shaw and Lempfert on the trajectories of air, embodied in the official publication "The Life History of Surface Air Currents," furnishes valuable additions to the knowledge that was at the disposal of the forecaster in the days of Abercromby and Clement Ley. The same may be said of the excellent studies of Lempfert and Coriess on the mechanism of line-squalls. In Chapter VI, on "The Physical Processes of Weather," the author has accomplished a *tour de force* in presenting the essential facts of the thermodynamics of the atmosphere in language that makes the subject easy of comprehension to the man of average education. Aside from the work of British meteorologists, there have recently been two important developments in the art of weather forecasting; viz., Guilbert's method of the "normal wind," and Ekholm's work with isallobars. Both of these are adequately treated in the present work.

Notes and Queries.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(12637) J. V. P. writes: A correspondent of one of our local papers claims to be the first discoverer of an alleged connection between the moon's perigee and the occurrence of earthquakes, and accordingly predicts shocks at or near the perigee dates; his idea being that the greater gravitational strains existing then cause or precipitate quakes. Can you give any information as to the force exerted on the earth by the attraction of the moon in the positions of perigee and apogee? Sir Isaac Newton observes that this attraction is sufficient to move the seas, but so far as he could observe would not be able to produce any other effect sensible on our earth. Also that the attraction of both sun and moon is five hundred times less than what is required sensibly to increase or diminish the weight of any body in a balance. Have later experiments or discoveries modified these premises? Do actual records prove that quakes occur oftener at those periods than at other times? If Newton's last observation given above is anywhere near correct, how can this strain affect the equilibrium of any of the solid portion of the earth? A. We should be inclined to mark as "interesting, if true," the statement that a connection between earthquakes and the moon's perigee and apogee had been proved or discovered by a newspaper correspondent, since mathematicians and astronomers have not been able to make out any such connection. We have not noted anything very recently upon this matter, but think it has been given up by investigators as not likely to yield any further results. Of course we may be mistaken in this opinion. Young's "General Astronomy," under "Tide-raising Force," has this statement: "A body weighing 4,000 tons loses about 1 pound of its weight when the moon is overhead or under foot." And again: "Attempts have been made to observe directly the variations in the force of gravity produced by the moon's action, but they are too small to be detected by any experimental method yet contrived. Both Darwin and Zöllner found that other causes which they could not get rid of produced disturbances more than sufficient to mask the whole action of the moon." The sun's tide-raising power is about two-fifths that of the moon. These statements furnish very little basis for an expectation that anyone will be able to discover any connection between the varying distance of the moon from the earth and the heavings of the surface of the earth.

(12638) G. C. asks: Why is it that geographies and teachers in general propound that certain winds of the earth are due to "slippage" of the former on account of the rotation of the latter? Now this seems to me in express contradiction of Newton's first law of motion—inertia. For why should the air slip when there is no friction and when the earth with all on it has been rotating for untold centuries? Perhaps it is on account of the attraction of the sun or moon, as is the case with the tides. A. You are quite correct in saying that Newton's first law of motion is involved in the deviation of the winds which flow from the polar regions toward the equator. They are changed in the northern hemisphere to the northeast trades and in the southern hemisphere to the southeast trades. If the air moves to the south in the northern hemisphere, it will move from a place where the rotation of the earth is slower to one where it is more rapid. Because of inertia the air retains or tends to retain the eastward velocity of the place from which it came, and for that reason it finds itself moving toward the east more slowly than the place to which it has come. This gives it an apparent easterly velocity, changing it from a north to a northeast wind in the north torrid zone. Similar reasoning explains the southeast trades in the southern torrid zone. The anti-trades are southwest winds in the temperate zone, because the air is moving toward the north and comes to a place where the earth is rotating more slowly in miles per hour, which gives the wind an easterly motion and changes a south into a southwest wind. For all this see any good book on meteorology or physical geography. We recommend and can supply Waldo's "Meteorology," price $1.65. This fact is stated as a law in Waldo, as follows: "If a free-moving particle (such as air) moves along near the earth's surface, there is a force arising from the diurnal rotation of the earth which deflects it to the right of its course in the northern hemisphere, and to the left of its course in the southern hemisphere." As an illustration of this a rifle ball in latitude 50 degrees, moving 1,500 feet per second, discharged at a target 3,300 feet distant, would deviate about 4 inches to the right in the northern hemisphere. This as Waldo says may seem small, but when the masses of air move day and night over thousands of miles, the effect becomes great.

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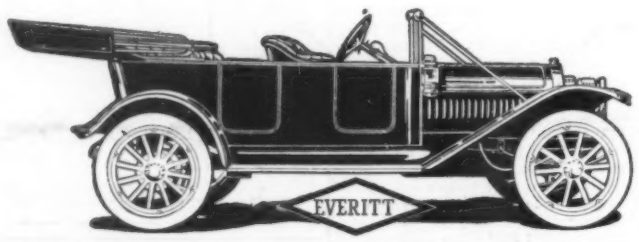

EVERITT "Six-48"—$1850—Wheelbase, 127 inches; Tires, 36x4 inches; Demountable Rims; Equipment complete, including Disco Self-Starter, Top, Windshield, two Gas Lamps, three Oil Lamps, Speedometer, Prest-O-Lite Tank, specially designed Tire Irons on rear, Horn, Tools, etc.

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